School Shop

October, 1941 Vol. 1 No. 1

How Goes Industrial Arts?
by Maris M. Proffitt

A Prize-Winning Telescope
by John Orban, Jr.

Chicago's Craft Clubs
by Louis V. Newkirk

A Practical Shop Clean-up Method
by G. Willoughby and D. Chamberlain

Tested Projects: News from Industry: Instructional Resources; Washington Letter: Personalities

Wanted—Manuscripts

School Shop is seeking short, practical articles on shop subjects. Payment will be made on publication for material used. Articles are wanted in the following subjects:

Education
T
61
.S37
v.1

Woodworking	***Electrical shop***	***Mechanical drawing***
Metalworking	***Handicrafts***	***Auto mechanics***
Machine shop	***Ceramics***	***Aeronautics***
Graphic arts	***Textiles***	***Etc.***

Descriptions of courses of study and curriculum changes are also desired as well as short items of a paragraph or two describing helpful practices in the school shop.

When preparing manuscripts, please keep the following points in mind:

1. The manuscript submitted should not have been published elsewhere.
2. Manuscripts should be typewritten and double spaced.
3. Title of the manuscript should be followed by the name and teaching position of the author, including the name of the school.
4. Illustrations will greatly enhance the value of manuscripts. Provide, if possible, large glossy photographs.
5. Line and working drawings and detail layouts should be as complete as possible, with lettering in black ink.
6. Drawings, illustrations, and photographs should include name of author and self-explanatory titles or legends.
7. Descriptions of projects should include complete list of materials, average time for completion of the project, and a few words on the educational value of the project.

Manuscripts should be addressed as follows:

THE EDITOR

SCHOOL SHOP

P. O. BOX 100, ANN ARBOR, MICHIGAN

An Explanation

of the Circulation Policy of *School Shop*

SCHOOL SHOP is being sent on a complimentary basis to all teachers and supervisors of shop subjects in the United States. The rate to all others, including library and school subscriptions, is $2 a year. Canadian and foreign subscriptions are $3 a year. Special rates apply to group subscriptions to teachers in training. Write for complete details.

This policy has been established by the publishers as a service to shop teachers. Publication of the magazine is made possible by the support of the reputable firms using advertising space in its columns. They deserve your support.

SCHOOL SHOP will be glad to add the names of shop teachers and supervisors who might not be included on the list at present. However, new names must be those of bonafide teachers or supervisors. Names will be added only when the request is made on school stationery and the subject taught is included. Send such requests to

CIRCULATION DEPARTMENT

SCHOOL SHOP

P. O. BOX 100, ANN ARBOR, MICHIGAN

Education
Gift
Prakken Publications
10-23-64

Next Month's Highlights:

1. "Keep Them Flying." How Chanute Field turns out 2500 aviation mechanics a month!
2. "Movies Invade the Machine Shop."
3. "Oakland's Class in Repair-Shop Mechanics."
4. Shop-tested projects in wood and metalworking.
5. And these regular features: What do you think?; Instructional Resources; Washington Letter; Personalities.

Don't Miss Them in Next Month's Issue!

EDITORIAL ADVISORY BOARD

M. Reed Bass, Director, Ranken School of Mechanical Trades, St. Louis, Missouri
Earl Bedell, Director of Vocational Education, Public Schools, Detroit, Michigan
Elmer W. Christy, Director of Industrial Arts, Public Schools, Cincinnati, Ohio
George B. Cox, Professor of Industrial Education, Oregon State College, Corvallis
Roy G. Fales, Supervisor of Industrial Arts, State Department of Education, Albany, New York
George Fern, Director, State Board in Control of Vocational Education, Lansing, Michigan
V. P. McKinley, Professor of Trade and Industrial Education, University of Alabama. University
George E. Myers, Professor of Vocational Education, University of Michigan, Ann Arbor
Irvin S. Noall, Supervisor of Industrial Arts and Occupational Education, Public Schools, Salt Lake City, Utah.
Floyd W. Reeves, Director, Labor Supply and Training, Office of Production Management, Washington, D. C.
John J. Seidel, State Director of Vocational Education, Baltimore, Md.
Leslie G. Stier, Principal, Frank Wiggins Trade School, Los Angeles, California
F. Theodore Struck, Head, Department of Industrial Education, Pennsylvania State College, State College, Pennsylvania

•

Editor
Lawrence W. Prakken

Consulting Editors
Marshall L. Byrn and Thomas Diamond

Advertising Manager
John M. Trytten

•

School Shop

FOR INDUSTRIAL ARTS & VOCATIONAL EDUCATION TEACHERS

CONTENTS

October, 1941
Vol. 1, No. 1

How Goes Industrial Arts? Maris M. Proffitt 3

The Consultant in Industrial Education of the U. S. Office of Education reviews the progress of industrial arts in the last two decades and predicts some near-future changes.

Project of the Month: A Prize-Winning Reflecting Telescope. John Orban, Jr. 6

Garden City, N.Y., shop students build a telescope with an 8-inch mirror for the school science department.

Chicago's Craft Clubs. Louis V. Newkirk 10

Hobby interests are developed early in the school careers of Chicago children.

Two Tests in Mechanical Drawing. Thomas Diamond 11

TESTED INSTRUCTIONAL PROJECTS—

These projects have all been tested in school situations and found useful in shop teaching.

Knurling on the Lathe 12

A Toy Electric Motor 12

Making Rope from Binder Twine. Raymond S. Orr 16

A William-and-Mary Dressing Table Bench. Earl W. Boyer 18

Instructional Resources: Books, Pamphlets, Visual Aids 19

Listings in easy form for clipping and filing.

What Do You Think?—Should school printing shops be used for the production of school forms? 20

SCHOOL SHOP asked several printing teachers this question. Herewith are their replies.

Personalities 20

A Practical Shop Clean-up Method. George A. Willoughby and Duane Chamberlain 22

How to set the shop in order with a minimum expenditure of teacher and pupil time.

News from Industry 23

New products; new equipment; and industrial advancements.

Washington Letter 24

News from the Nation's Capital of particular interest to shop teachers.

Index to Advertisers 24

School Shop is published monthly, September through June, at Ann Arbor, Michigan. Manuscripts are paid for at regular space rates and should be addressed to the Editor, School Shop, Box 100, Ann Arbor, Michigan. Subscription rates to libraries and institutions, $2.00 a year; Foreign and Canadian, $3.00 a year. 25 cents a copy. Printed in the U. S. of A. **Copyright, 1941.**

Why SCHOOL SHOP?

TWO compelling factors led to the establishment of SCHOOL SHOP. First, more than two-thirds of the shop teachers in the country now receive no publication edited exclusively for them. Second, the field of industrial arts and vocational education is expanding tremendously.

Illustrative of the second point is the situation in Michigan where enrolments in public school shop subjects have more than trebled in the last ten years. The U. S. Office of Education estimates that two million pupils are now enrolled in shop courses and this figure will undoubtedly increase in the years to come.

High-school age youth, prevented from seeking employment by legislative enactment, are eager for curricular programs offering orientation to industrial life. The national-defense program has emphasized the need for industrial education. Commissions, committees, and inquiries have continuously pointed out the growing technological nature of our society and the imperative necessity for the school to adapt its program to the job of training students for life in such a society. SCHOOL SHOP pledges itself to advance industrial knowledge as a fundamental requisite in the training of *all youth*.

The editorial policy of SCHOOL SHOP will not be static. Rather it will be based on fulfilling the requirements of the teachers in the field, shifting as their interests and needs change. The major emphasis will be placed on the publication of material that will help the teacher do a better job of teaching. Articles will be carried interpreting the place of industrial arts and vocational education in the pedagogical world. But primarily material will be published describing the actual procedures involved in carrying out the educational function of the school shop program. Projects are not enough. Unless they are educationally meaningful, they are without merit. The purpose of SCHOOL SHOP is to present projects and articles which have an objective—which are more than mere busywork—which supply the answer when the student asks, "Why am I doing this?"

Among leaders in the profession there is an unfortunate schism based on objectives. Industrial arts leaders compete with vocational education adherents who have the advantage of a federal subsidy to implement their program. SCHOOL SHOP does not look upon this internecine rivalry as an "either-or" proposition. There is a place for both types of education. Industrial arts education, taught for its appreciation value and general educational content, is needed by all students, particularly in an industrial civilization, regardless of the later occupation of students. Obviously there is also need for specific trade training. Modern techniques are being developed to analyze occupational trends so that some prognosis may be made of employment needs by time and area. Aptitudes can now be measured with some degree of success. These techniques will help to solve the problem of when and where and to whom trade training should be given. Using similar teaching techniques, but with different objectives, industrial arts and vocational education are two important divisions of the educational program of the nation. Each can stand on its own merits.

SCHOOL SHOP also advocates the correlation of shop work with other elements of the curriculum. Every shop problem is an application of a scientific principle. Every industrial application has its social import. Every project involves reading and mathematics. The shop teacher is not insulated as an educator.

We have a few requests of our readers. We ask that they tell us what type of material they wish published. In addition, we ask that they write articles themselves describing their educationally successful enterprises. Payment will be made for articles. Lastly, we request that our readers patronize our advertisers whose interest and support make the distribution of SCHOOL SHOP possible. These firms are reputable organizations with many years of service to the profession. They warrant your business.

SCHOOL SHOP has been established to serve shop teachers. We will do our best which sometimes may not be quite enough. We hope that our sins of omission will be forgotten and our sins of commission forgiven. We seek your indulgence and assure you of our good intentions.

SCHOOL SHOP enters the field with supreme confidence in the future of industrial arts and vocational education and faith in the intrinsic merits of the field. SCHOOL SHOP hopes to be of service in promoting the truly educative functions of shop subjects since it is upon education that the future of the people rests.

Development of the general shop is the outstanding trend of the present, according to Maris M. Proffitt, who foresees its continued rapid growth. Above is a typical general shop in a Detroit, Michigan, high school.

HOW GOES Industrial Arts?

to the teacher should go the credit for today's fine program, says . . .

Maris M. Proffitt
Educational Consultant and Specialist in Industrial Education, U. S. Office of Education

IT IS a far cry from the day when practically the only offerings in what is now termed "industrial arts" were manipulative work in wood and metal —most of it in wood—to the present program of various shop activities together with a rich offering in informational content. To the teachers should go much of the credit for the development of the comprehensive programs of today, as they had an abiding faith, manifested through their work, that the manipulation of materials with the common tools of construction was an effective form of educational training.

During the past twoscore years, changes in thought and practice in general education have had a highly stimulating effect on the development of industrial arts. Among the most influential changes may be mentioned: the tendency toward deriving the curriculum from fundamental human experiences of present-day life; the tendency in practice—we have long had it in theory—toward providing pupil experiences in an increasing order of specificity; the tendency toward providing instruction in accordance with developmental levels of pupils; the tendency toward a more real and practical interpretation, translated into school activities, of objectives in education that have long been generally accepted. All these have been conducive to growth of sound practices and enlarged offering in the curriculum in industrial arts.

Following is a summary, by large categories, of some of the apparently outstanding trends in industrial arts as they have been noted from reports made to the United States Office of Education and from observation and study:

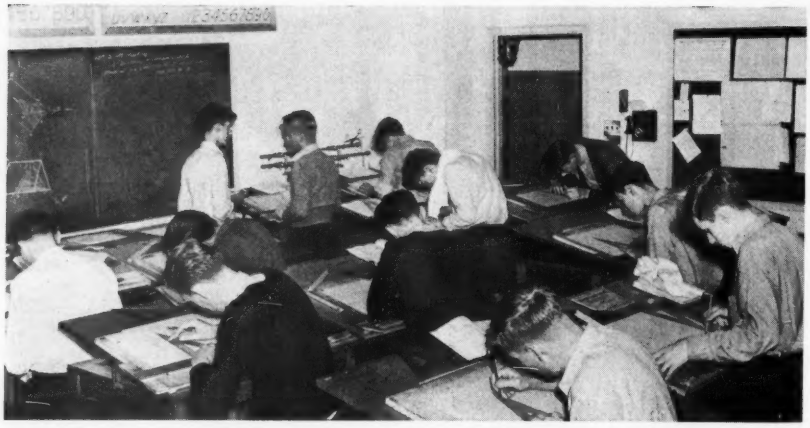
1. Alignment with objectives and principles obtaining in general education.

In both theory and practice, industrial arts is now being considered as an area in general education, not as a special subject or a special phase of education having specific occupational values. It is assumed, however, that as pupils progress through the school and advance in maturity, the industrial arts work offered them will become more specific with reference to *(a)* the individual needs of pupils; *(b)* the activities included in the program; and *(c)* the purposes the activities will serve in the adjustment of pupils to adult life.

Well-organized instruction in industrial arts today is in accord with the philosophy and principles underlying the experience curriculum. If anywhere in the school curriculum "exercises" still predominate, it is not in the industrial arts area. As a matter of fact, at the present time industrial arts teachers are in the forefront of the movement to organize the curriculum on the basis of pupil experiences that conform to the developmental levels of the pupils.

2. A broadened program of activities.

The general trend toward a broadened program of activities can be analyzed into three specific movements, as follows:



Today's pupil plans a project, makes a sketch of it, prepares a bill of materials, and lists the operations to be performed before construction work begins.

(a) *To increase the number of shop activities and the variety of media used, thus affording enriched opportunities for manipulative work—for values inherent in self-expression and exploration.*

There is an ever-growing tendency to increase the number of shop activities included in the industrial arts. It is interesting to look over the literature of the past few years and find that instead of one or two shop activities formerly offered, the number may now be as large as seven. This broader field of offerings appeals more to the pupils. It subserves variety in pupil interests and makes possible self-expression—a fundamental principle in industrial arts education—in a wide range of desirable media.

This increase in the number of shop activities is complemental to the increase in industrial activities and in kinds of construction materials—for example, plastics—which pupils observe in the world about them and which motivate their interests for enriched experiences. Ceramics is finding a firm foothold in the industrial arts program. Photography is making a strong appeal both to the interests of pupils and to industrial arts teachers who see its educational values. In addition to the increase in activities resulting from introduction of large numbers of materials in which pupils work, there is also an increase in the variety of activities included in materials which have been standard media for years. The term "general" now frequently applied to a shop activity is indicative of this, as in "general woodwork," "general metal work," or "general electricity."

(b) *To include provisions, as a part of the industrial arts program, for the acquisition of information about industrial products and services.*

Provision for the development of information of value for the selection, purchase, use, and care of industrial products and services in common use is an observable trend in industrial arts programs. With reference to instruction for this purpose it is pointed out that: (1) it ranks high in values for certain life experiences; (2) it should be given by teachers qualified by both practical experience and education to analyze and evaluate industrial products included for study, with reference to their design, construction, workmanship, and material; and (3) it may be given as informational content—for pupils with a proper background for understanding—without the need of construction work.

(c) *To include provisions, as a part of the industrial arts program, for the acquisition of information about industry and its influence on human affairs.*

The importance of this is appreciated when we give thought to the fact that we live in a society the predominant element of which is industry—industry characterized by the power-driven machine. The development of the machine, the production of power and its universal application, together with the industrial products and services resulting therefrom, are determining, as does no other single factor, the pattern of our social order.

For example, a labor-saving machine is invented and thousands of persons are thrown out of employment with the result that a social practice must be formulated to aid in the readjustment of these persons to a state of economic independence; a machine for more rapid transportation is perfected and communities are merged and community objectives, standards, and social attitudes are changed; a machine for improved communication is installed and consciousness of social relationships is quickened the world over.

The trend is definitely in the direction of broadening pupil experiences in industrial arts to include information that will help toward an understanding of industry and its products and services and their influence in our social order. In connection with this thought, it is here pointed out that some of the topics now included in the so-called social science subjects, taught by an academic teacher from a textbook, will probably in the future be included as an integral part of the industrial arts program. This is logical for the reasons that (1) industry is a component part of our society, and in accordance with sound principles of curriculum building, instruction relative to the part industry plays in our social order should be included in the curriculum area dealing with industry; and (2) the industrial arts teacher is usually better prepared by experience and education to give such instruction than is the academic teacher.

3. General-shop form of organization.

If a single outstanding trend of the present were to be used as a guide to the future of industrial arts education, it would most certainly be the trend toward the general shop. Probably nothing in industrial arts work has shown as much growth on a country-wide basis as has general shop—especially for the junior high school level. That this will continue seems to be beyond the shadow of a doubt. The reasons for this are obvious. The general-shop form of organization (a) provides for a variety of media, and consequently of activities for pupil experience in manipulative work; (b) provides an excellent opportunity for acquiring, in a realistic way, information about industry and our industrial society; (c) offers a large variety of activities that make it more nearly possible to provide pupils with experiences in accordance with their interests and developmental levels than does the unit shop; (d) accords well with the educational objectives and principles underlying the organization of the junior high school, in which industrial arts work is now generally required for the first two years; and (e) makes it administratively possible to offer industrial arts in a larger number of communities than would be otherwise possible.

Closely related in aim and function to the general shop is what is called by some the *laboratory of industry*. As the name suggests, this form of instructional organization places emphasis upon values growing out of experimentation, analysis, and exploration in materials,

processes, and products of industry, involving manipulative work and study, much the same as is carried on in the general shop. As an illustration, attention is given to elemental, primary operations, formerly done by hand but today performed as intricate processes in the work of a complex machine producing an industrial product; for example, weaving on a hand loom. In addition to other values, this serves well to give an understanding of how textile products are made, which is not easily possible from an examination of goods or from watching a modern textile machine operate, even if one were available for observation.

4. Increasing Enrolments.

Enrolments in industrial arts are increasing in many places. This is due principally to the following reasons: (1) the value of industrial arts work for general education objectives is becoming better and more generally understood; (2) more schools than formerly are offering free electives in industrial arts in senior high schools, with consequent higher enrolment; (3) the growing concept of industrial arts as an *area* in the school *curriculum*—including extensive pupil experiences significant for essential objectives of education—rather than as a school *subject,* is affecting favorably the proposal to make industrial arts available in more years and to more pupils, including girls; (4) modern industrial arts programs employing general types of experience rather than the narrow programs of unit shops, are attractive to school administrators as well as to pupils.

In New York state, for example, it is reported that where general woodwork, general metal work, and general electrical work have supplanted in the senior high schools such unit-shop courses as auto mechanics, electricity, and machine shop practice, the enrolments have increased 50 percent.

5. Increasing the qualifications of teachers.

The qualifications of industrial arts teachers with respect to general education are being increased. A college education is now rather generally required, and probably no great advantage will accrue from having industrial arts teachers merely take more academic subjects. A great advantage may be had, however, from giving industrial arts teachers a baptism of professional education, including attention to present movements in the whole field of education, to administrative practices governing the organization and operation of public-school systems, to child psychology and development, and to the study of changing social patterns in life and the part that industrial life plays in such changes.

6. Improved physical facilities.

Industrial arts may not have attained a very desirable position on the road to good housing, but it has at least come a long way from a dingy and poorly equipped basement room of the school building. Shops and other rooms for industrial arts activities are lighter, cleaner, and better arranged than formerly, thus facilitating the work of the pupils. There is, however, a general lack of adequate and proper housing facilities that constitutes a handicap in reorganizing industrial arts work in accordance with modern ideas.

Nevertheless, there are scattered through the country some good examples of housing arrangements for industrial arts classes that give encouragement and that may influence future planning. There are a few state teachers colleges that have housing facilities in keeping with their programs organized in accordance with modern ideas for industrial arts work. By example and through the teachers they train, such institutions are influences for better housing facilities for industrial arts work in public schools. State departments of education are also giving more attention to, and exercising a greater influence over, plans for school-building construction than they formerly did.

7. Extending pupil experiences beyond the four walls of the classroom.

The interest in industrial arts is carrying beyond the limitations set by class periods and beyond the confines of the shop. In some places, arrangements have been made for pupils to work in the shop after school hours, with the result that more pupils seek this privilege than are enrolled in the shops during the school day. In other places, groups of out-of-school persons, or in-school persons meeting during after-school hours, hold their meetings at the school.

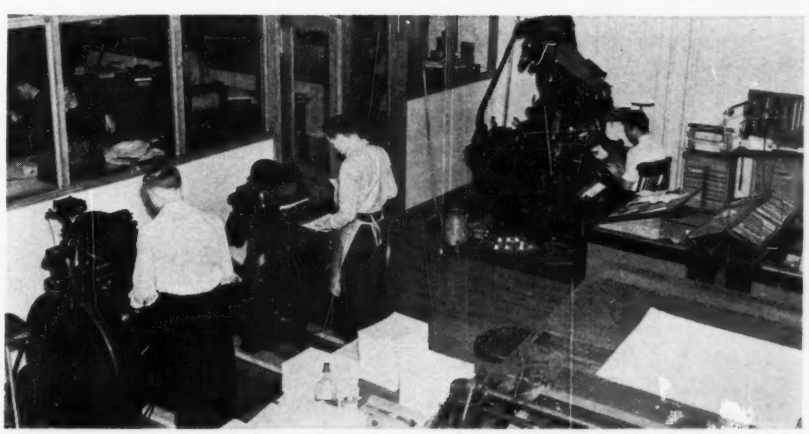
Often schools organize various kinds of industrial arts clubs and also sponsor, through the teacher, clubs organized outside of the school. Many schools are giving encouragement — again through the teacher — to home workshops in which not only the pupils but often the parents become interested.

8. A keener realization of the value of industrial arts for girls.

Leaders in industrial arts education keenly regret that they cannot report a strong trend in practice toward providing industrial arts work for girls. There is, however, a growing consciousness that industrial arts ought to be extended to them, and in some schools are examples of special activities—in addition to those general ones included on the junior high level—that may be expected to set future patterns of development of significance to girls. Among such activities are: (a) house planning; (b) use of electricity in the home; (c) home mechanics; (d) art jewelry; (e) ceramics; (f) wood finishing; and (g) photography.

The trend in industrial arts to broaden shop activities in accordance with general education objectives and to emphasize the acquisition of information for general industrial intelligence, as a part of this curriculum area, will do much to overcome a curriculum situation unfavorable to girls. It is perfectly evident that girls, by every natural right, will eventually have included in their educational experiences more adequate opportunities than exist at present for study and self expression in the media employed in industrial arts work.

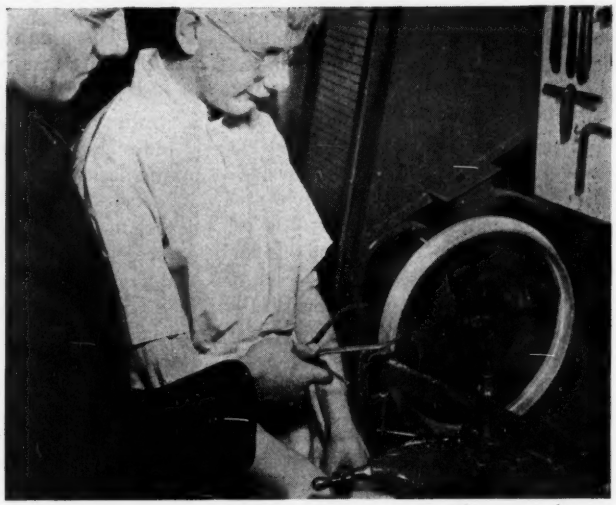
Modern school shops have come a long way from the dingy and poorly equipped basement rooms of former years.



Project of the Month:

A Prize-Winning Reflecting Telescope

By **JOHN ORBAN, JR.**



Checking measurements on the end ring.

THROUGH the combined effort of the science, art, mechanical drawing, and industrial arts departments Garden City High School students have constructed an eight-inch Newtonian type reflecting telescope. This project has attracted wide attention and was placed on exhibition at the New York World's Fair last summer. Moreover, it won first prize at the American Institute of Science and Engineering Fair held annually at the Museum of Natural History in New York. The "big eye," as the students called it, was also given individual awards for excellence in technical skill, creative ability, and as an outstanding example of scientific thinking. The judges further lauded the work by labeling it "an outstanding piece of work." Additional honors came when officials of the Westinghouse Electric Company asked that it be placed atop their building at the World's Fair so that their many visitors might use it in the evenings. An unexpected outcome was the employment of our students to demonstrate it to World's Fair visitors during the summer months.

The project was started a year ago when the science students at the Garden City High School wanted a telescope of their own. Any teacher who has inquired about the price of a telescope knows that the cost stops any further consideration for high-school use. Undaunted, several students suggested that a reflecting telescope be made. Full of enthusiasm, they visited the library only to find that a few general articles and one good book for general reference were available. Plans and blueprints were nonexistent.

The Hayden Planetarium came to their rescue, however, when the author discovered that it was conducting a course in telescope making. He enrolled and started construction of a small model for himself. Drawings, plans, and suggestions for the best type of instrument for school use were brought back to the shop students.

These students wanted no toy! Their preliminary drawings showed a finished instrument standing nine feet high and weighing several hundred pounds.

Students and the heads of the science, art, mechanical drawing, and industrial arts departments met and began plans for construction. By this time the author had already been working on his own small model for three months and had gone far enough ahead to supervise the work on the school model. It was his job to keep abreast of the crew and to bring back ideas and suggestions from the experts at the planetarium.

We learned that a Newtonian reflecting telescope would be the easiest and

The student crew examines some of the parts of the telescope which cost approximately $200. If purchased, such a telescope would cost more than $1500.

This excellent illustration of a class project is particularly outstanding because it shows the possibilities for cooperative effort between the industrial arts department and the other departments in the school. This project involves mechanical drawing, pattern-making, forging, casting, machining, finishing, and woodworking which gives opportunity for large numbers of students to participate, utilizing their special abilities. The author, who is a science teacher in the Garden City, New York, High School, is planning to publish a book shortly which will give complete working plans for the telescope. He will be glad to furnish further information about any phase of construction.

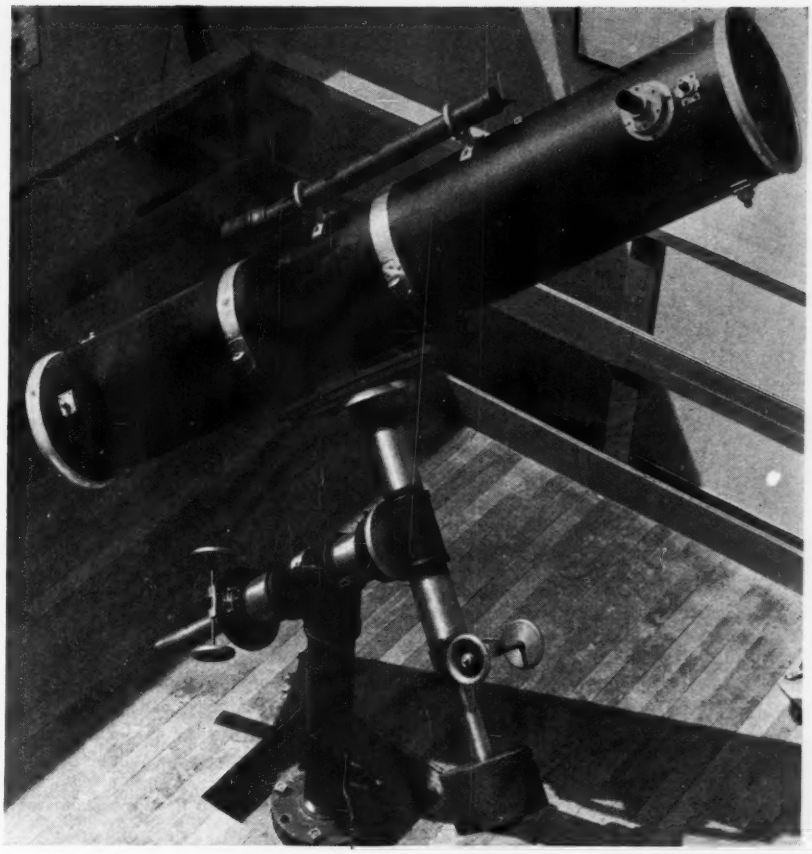
cheapest to make and to mount. In the optical system of a Newtonian telescope the light from outer space enters the tube and strikes a parabolic mirror at the bottom of the tube. The mirror reflects the rays of light and produces an image at the point of focus back in the tube. A small flat mirror, called a diagonal, intercepts the converging rays and sends them through a hole in the side of the tube to a lens, called the eyepiece, where the image is received.

The author's plans were checked by the different departments and when all flaws were ironed out the ideas were turned over to the art department. The art department made perspective sketches of the proposed parts and then turned their work over to the mechanical drawing department where the final blueprints were made. Then began the long job of the industrial arts and science departments to turn those blueprints into an instrument of steel, iron, bronze, and aluminum.

The boys selected to work on the project had to be excellent students who were willing to work after school, during weekends, and vacations. They were expert mechanics, thanks to an industrial arts department which is progressive enough to present real challenges to boys of ability. A precision instrument such as a telescope entails a great amount of care and accuracy. Shop work becomes something vital, alive, and important.

The handbook for telescope makers is a book published by the Scientific American Publishing Company called *Amateur Telescope Making* which is commonly referred to as ATM. It is an excellent book with articles on the theoretical and practical aspects of telescope making. Unfortunately, it does not give full details for the construction of any one type of telescope. It is invaluable, however, as a reference book and as a starting point for ideas.

The most important part of the telescope is the mirror. The optical system requires a parabolic mirror, a diagonal, and the eyepiece. You will have to grind the mirror. The diagonal and eyepiece can be easily obtained. To hold the mirror, diagonal, and eyepiece it is necessary to construct a tube and a stable mount to maneuver it. The telescope which was constructed under the author's direction used a mirror with a diameter of 8 inches and a focal length of 64 inches. From my experience I would suggest that a beginner start with a 6-inch mirror. It is easier to grind and to mount and the results for high-school use are excellent. A kit containing a 6-inch Pyrex flat, which will be the finished mirror, a plate-glass grinding tool, all the needed abrasives, the rouge for polishing, and other accessories can be purchased for slightly less than five dollars. This kit can be obtained with complete directions for grinding and testing from Mr. R. S. Luce of the Amateur Astronomers' Association, Hayden Planetarium, New York City. Persons interested in making a telescope for themselves or for an institution will find Mr. Luce a veritable fountain of information on telescopes and their construction. He is very cooperative and eager to help anyone interested. Information on mirror grinding, polishing, and figuring is also covered in ATM.

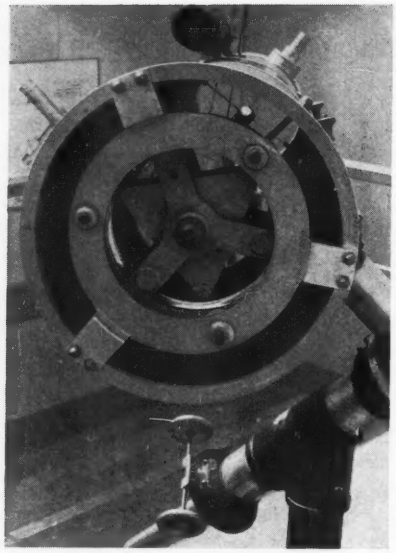


This student-made reflecting telescope stands 9 feet high, has an 8-inch mirror, and a top magnification of 256 times.

After the mirror is completely figured and polished, it requires a reflecting surface. Aluminum is now commonly used instead of silver. Silver gives the best reflecting surface but tarnishes within a few months. An aluminized mirror will probably last many years and is comparatively inexpensive. Mr. Leroy Clausing of 720 Greenwood Avenue, Wilmette, Illinois, does an excellent job of aluminizing at a reasonable figure.

Having painstakingly ground the mirror to within a few millionths of an inch accuracy, the next job is to create a suitable mount and tube for this piece of polished glass which you will value more than an ordinary diamond. As a matter of fact the market price for a finished 6-inch mirror is almost one hundred dollars, and the greater the diameter the greater cost. Considerable work must go into that five-dollar kit to produce a shining mirror. It is indeed fitting that the carefully ground mirror be housed in an equally carefully built tube and mount. A good mount must be strong, stable, and easily maneuvered. All parts must be carefully measured to exactness and thought must be given to its planning and construction.

First, select the material from which to make the tube. Aluminum was used extensively until recently because it was easy to work and because it looked attractive. The author used 16-gauge sheet iron for the school telescope and purchased a bakelite tube for his own. Due to the present defense restrictions, it will probably be impossible to get the aluminum or bakelite. Your local tinsmith or boilermaker can probably



End view showing cell parts and bottom of mirror. Diagonal mirror can be seen in far end.

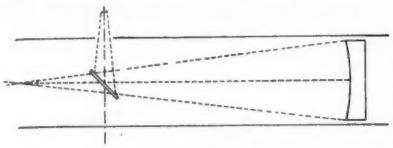
fix up a tube from sheet iron. I recommend the use of bakelite if obtainable. Its initial cost is higher than iron or aluminum but is much easier to work, is more attractive in appearance, and requires a much lighter mount. It can be purchased in any lengths and diameters in seamless tubes from the Synthane Corporation, Oaks, Pennsylvania.

The next job is to mount the mirror in a cell which will hold it steady at the far end of the tube. The photograph of the end view shows the cell as it fits in the tube. The cell parts, end rings, and diagonal parts were all purchased as rough aluminum castings from Mr. Luce. These were machined, drilled, and tapped in our shop to the blueprint sizes. All the studs, lock nuts, and fittings were made by our student workers as were some of the other castings. The cell ring was fastened to the tube by drilling and tapping the ring with ¼-inch studs. Brass hexagonal nuts were used to finish it off. Then the cell which will hold the mirror is fastened to the cell support ring by three studs. The center cell screw may be adjusted to transmit pressure on the equalizing triangle on which the mirror rests. Three ¼-inch ball bearings imbedded in each corner of the triangle are the only sources of contact for the mirror. The mirror itself is clipped in by three clips at the top of the cell to hold it. Leather strapping is fitted between the mirror and the cell. In this way the mirror comes in contact with metal only at the three ball bearings and at the clips. With this arrangement temperature changes cannot be readily transmitted from metal to the glass and will not result in the distortion of images.

When the mirror is placed in the cell it will direct all the rays of light back up in the tube a certain distance, depending on its focal length. The flat diagonal mirror must now be fitted to bend the rays of light at right angles out through the side of the tube to the eyepiece. An arrangement called a "spider" is designed to hold the diagonal in the object end of the tube. Its sole purpose is to direct the rays converging from the mirror at the eyepiece with the least possible interference of rays coming down the tube. It blocks out some of the light entering the tube but the area of the diagonal is small compared with the surface area of the mirror. The loss is relatively unimportant. Size of the flat mirror must be determined by formula involving the focal length and diameter of the ground mirror. Consult ATM. A reasonably flat rectangular or elliptical piece of common commercial plate glass will do. It may be polished to optical flatness if you desire.

The four struts of the spider are made of spring steel. Screws on the outside

The optical system of a Newtonian telescope.



of the tube enable it to be adjusted in a plane at right angles to the rays from the mirror. Once adjusted, it need not be disturbed until the mirror is removed for cleaning. The diagonal is held in the spider by three clips and directs the image to the eyepiece on the side of the tube. The eyepiece holder must be fastened to the tube so that reflected image will come within two or three inches of the tube. The location of the eye-piece on the side of the tube must be at the focal length from the surface of the mirror. The holder itself is a small casting of aluminum which will need machining to take a piece of brass tubing for sliding adjustment. A sliding 1¼-inch brass tube within it will carry the eyepiece itself. Two object lenses, one high power and one low power, are sufficient for high-school work and can be purchased through the A.A.A. or a lens manufacturer. They cost only five or six dollars each.

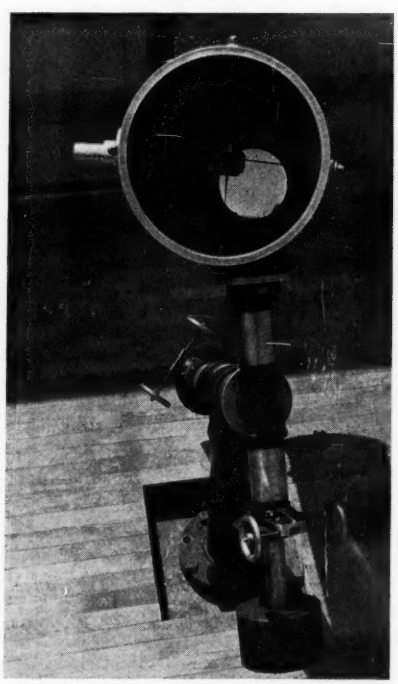
The next job is to make a suitable equatorial mount. Once an equatorial mount has been adjusted to the observer's latitude it need never be touched unless the mount is taken to some other location. With a mount of this type any star can be followed by revolving the declination axis and the mirror and tube about the polar axis. The polar axis gives the needed slow motion to compensate for the earth's rotation. An equatorial mount equipped with setting circles can enable the stargazer to select any celestial object above the horizon and, by consulting the *Nautical Almanac,* bring that object into view in the eyepiece.

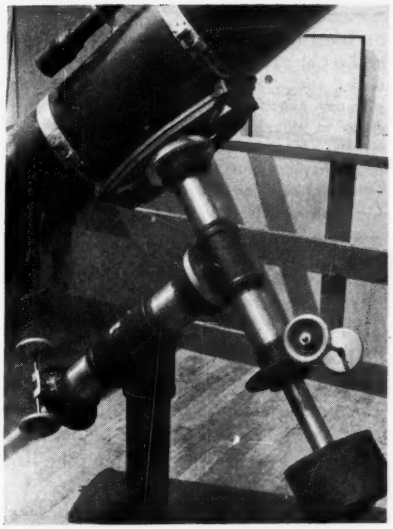
Many variations of mountings are described in ATM. It appeared to the author when he was faced with the problem of making a mount that no two telescope builders ever built the same mounts, consequently no one ever bothered to draw up any plans or blueprints.

As we used a very heavy tube of iron, the weight of the tube, mirror, and all the fittings was considerable. Therefore, we had to build a very heavy mount. The telescope maker should plan to construct a very sturdy support for the tube. There would be very little point in placing a carefully ground mirror in a mount that wobbles and is not lined up correctly. The images would be distorted and all the careful work in mirror grinding would have been for naught.

The tube must be held in a cradle or saddle. Ours was made of cast iron with two brass straps to hold the tube. The next job is to place tube and saddle in the mount arrangement. In making

View showing eyepiece and the diagonal mirror with the ground mirror in the far end of the tube.





View showing the mount with shafts, gears, saddle, and counterbalance.

the mount and obtaining parts for it, utilize the supplies of the local plumber and purchase drainage fittings and pipe to suit your needs. Our mount consisted of a 45-degree Y branch, a drainage T, nipples, and standard flanges. The shafts for the two axes were each 3 feet long of 2-inch polished steel. Since we decided on babbitt bearings, we had to use polished steel. If roller bearings are used, polished steel is not necessary.

The shaft for the declination axis was pinned to a steel saddle bearing which we machined on our lathe from a block of steel and to which we screwed our saddle. The other steel shaft was to be our polar axis and we threaded one end of it into our drainage T. We machined the end caps down to a smooth surface, polished the nipples, and screwed the mount together preparatory to pouring the babbitt bearings. After the babbitt was poured for both shafts and it was worked, lubrication was added until we had a fine bearing. We were now ready to make the first test assembly to iron out the mechanical kinks.

We screwed the big flange to the floor and began to build upward. First the big base nipple, then the drainage Y and the nipples and end cap to finish the shell for the polar axis. Then the shaft was placed in position and the nipples and cap placed on the T. The saddle bearing was pinned and the saddle screwed to it and finally the tube lifted and strapped in. We were very happy, to put it mildly, when we saw it assembled for the first time. There was still a great deal left for us to do. We had to balance the tube and mount and found we needed a counterbalance of 75 pounds for the declination axis. It was made of cast iron and fastened to the shaft with a collar. Many small minor adjustments had to be made before we were ready to place the mirror in the cell.

Our next problem was moving the tube for use in the observatory. We purchased two sets of gears and worms from the Atlantic Gear Company of New York to do the job. Plans were made for holders of the worm gears and wheels to turn the worms. We made our wooden patterns and cast them in our shop. We then machined them, fitted the worm gear, and placed wheels on the wheel rod. The gears were fastened to the shaft with set screws.

The job was now near completion. We began to "pretty" it. All the moving parts were polished and oiled. The nipples were tightened and pinned. All of the aluminum and brass fittings were given a brush finish and then laquered. A high smooth finish is too easily scratched and marred. The tube was given a prime coat and then finished with a dull instrument black. We added two circles, one for degrees and one for hours. Weights were checked and balanced so that the tube moved smoothly. The student workers, staff, and student body were all elated to see this shining instrument completely assembled in our shop.

A crew of 24 students worked a total of more than 1200 hours to complete it. It is now housed in a school observatory on the grounds and we plan to add a motor drive at some later date.

The cost was approximately $200. If purchased, it would cost at least $1500. One could be made for considerably less. Some of our money was used in experiments with different materials. With short cuts and less expensive material and a willingness to sacrifice some of the accessories, the cost could be halved.

We have used the telescope considerably this past spring and it outdoes even our greatest expectations. It has a top magnification of 256 times and brings to view undreamed of sights for our students and their parents. We plan to have students operate it one night each week this fall for parents and townspeople.

Why don't you make plans for a school telescope this fall? Its planning and construction presents a fine practical challenge to your school departments to correlate their courses about a major theme. You will provide your students with practical opportunities to utilize the theoretical knowledge ac-

(Continued on page 17)

NEW BOOKS
on timely subjects

Basic Units in Mechanical Drawing

BOOK I
Second Edition
300 pages
6 by 9
$1.60

By R. P. HOELSCHER and A. B. MAYS

This book has long been recognized as one of the foremost in its field. The second edition is distinguished for many features, among them its extensive scope (including new material on reading drawings and a new unit on map drawing), its use of the learning process as a method of teaching, its extensive questions and problems, with fifty-eight new ones, its excellent drawings (of which sixteen are new).

BOOK II of "Basic Units" is available in its first edition, priced at $1.60.

Essentials of Shop Mathematics

By SAMUEL SLADE and LOUIS MARGOLIS

Presents the basic mathematics necessary for shop workers in automobile mechanics, electric wiring, machine shop practice, printing, sheet metal work, wood work, and the aviation industries. Suitable not only for short unit courses but as the basis for more advanced, two-year courses in trade and industrial schools.

194 pages **5¼ by 7⅝** **$1.50**

Practical Air Conditioning

By A. J. RUMMEL and L. O. VOGELSANG

Covers essential fundamentals and definitions, descriptions of the properties of air and the requirements for human comfort, all types of equipment, including automatic controls, how to operate the equipment properly and at least cost, and complete maintenance and servicing methods and schedules. Written in non-technical language.

282 pages **5½ by 8½** **$2.75**

Airplane Maintenance

By HUBERT G. LESLEY

This book describes the various parts comprising a unit, the materials used, and the operating principles involved. It then gives the best methods of keeping each unit in good working order. It covers exactly the maintenance problems which every student mechanic needs to know.

511 pages **6 by 9** **$2.75**

ON APPROVAL COUPON

John Wiley & Sons, Inc.
440 Fourth Avenue, New York, N. Y.

Kindly send me the following books on thirty days' approval. At the end of that time, if I decide to keep them I will remit their price plus postage; otherwise, I will return them postpaid. (The prices quoted are subject to our usual educational discount.)

☐ Hoelscher-Mays I, $1.60 ☐ II, $1.60
☐ Slade-Margolis "Essentials," $1.50
☐ Rummel-Vogelsang, $2.75
☐ Lesley, $2.75

Name.....
Address.....
City and State.....
School.....

$S-10-41

The Craft Club meets at Anderson elementary school, Chicago.

Chicago's *Craft Clubs*

by Louis V. Newkirk

CRAFT CLUBS are an important phase of the club program in the Chicago elementary schools because they give the 300,000 boys and girls in these schools an opportunity to work with a variety of materials, to learn to use simple tools, and to express their ideas with an objective medium.

A recent survey shows that 90 percent of the Chicago elementary schools use craft work as a part of their club program. Of all the types of clubs that engage in craft work, 72 percent are organized primarily for craft work itself and for the interests it promotes. The greatest number of clubs is found in the sixth (21 percent), seventh (25 percent), and eighth (23 percent) grades. The number of craft clubs in individual schools varies from one to nine, the greatest number of schools having three clubs each. (Three clubs is the average per school.) Nearly one-third of all craft club activity is some type of needlework. Woodwork ranks second, while weaving and basket making, paper and cardboard construction, metal work and ceramics rate consecutively in popularity.

There was some variation of the crafts employed in the separate grades. Needlework, ceramics, paper and cardboard construction, and woodcraft were reported in all grades; leatherwork and electrical construction were most common in the upper three grades.

The Bureau of Handwork and Industrial Arts offers the following service to teachers: an exhibit of handwork materials and a library of recent craft books; consulting service to teachers who wish special help in conducting handwork activities; and pamphlets on correlated handwork and craft clubs to all teachers who request them.

The industrial arts research laboratory at the central office is open during the late afternoon and Saturday mornings for the use of teachers who wish to secure special instruction along the lines of their interests and needs.

As an aid to the sponsor of the craft club, a number of pamphlets dealing with club organization and the crafts have been prepared in the Bureau of Curriculum. One of these pamphlets, *Craft Clubs in the Elementary Schools*, contains information for organizing and conducting the club, methods and devices for sustaining interest, and suggestions for carrying the work into the home workshop. Another series of pamphlets entitled *Hobby Crafts for the Elementary Schools* consists of units in the crafts suitable for use in the club period, for example: needlework, woodcraft, metal work, leather work, and ceramics. These pamphlets contain information necessary for the development of elementary projects. They give descriptions of tools and materials, methods, bibliographies, sources of materials, and lists of supplies furnished by the board of education. Each pamphlet also contains a sequence of problems introducing new phases of the work.

Dr. Louis Newkirk is director of industrial arts in the Chicago public schools. His description of the craft club program in the Chicago elementary schools indicates the value of such clubs in developing the students' hobby interests, giving training in manual skills, and preparing the students for the more intensive industrial arts courses in the junior and senior high schools.

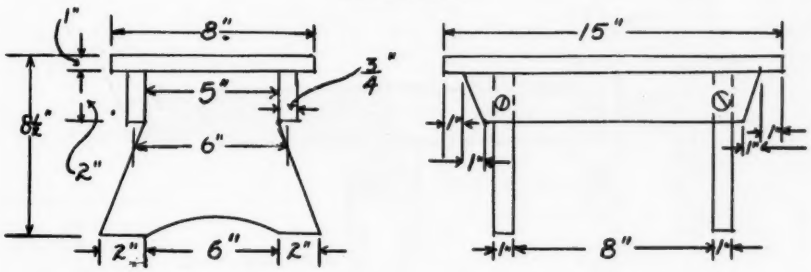
Boys and girls like art metal work at Nash elementary school, Chicago.

Two Tests in Mechanical Drawing

by Thomas Diamond

Professor of Vocational Education, University of Michigan

Test No. 1



Fill in the following dimensions:

Answer

1. Finished dimensions of the top piece _____
2. Thickness of end pieces_____
3. Thickness of side pieces_____
4. Width of side pieces_____
5. The greatest length of the side pieces _____
6. The length of the short edge of side pieces_____
7. The finished height of the legs_____
8. If one-fourth inch is allowed for planing how wide should the legs be cut?_____
9. The distance between the legs_____
10. The distance from the end of the top-piece to the outside of the leg?_____

Name _____Grade ___

Semesters in drawing (circle one).

Less than one, 1, 2, 3, 4, 5, 6, 7, 8.

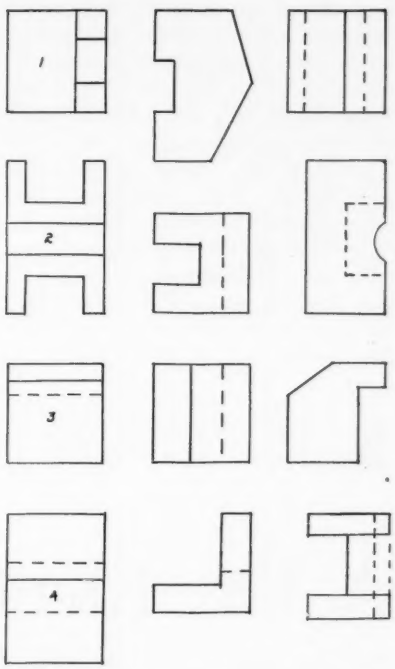
Test No. 2

The left-hand row of figures represents one view of four different objects. These objects are to be known by the numbers which appear on them. Thus we have objects 1, 2, 3, and 4. On the two lines on the right, two additional views of each of the objects are shown. These views are not placed in the conventional relation to one another or to the view in the left-hand line. The problem is to recognize the three views of each of the objects and to mark the two righthand views with a number which will show its relationship to one of the views shown in the left-hand line.

Age _____ Grade _____

Semester in drawing (circle one).

1, 2, 3, 4, 5, 6.



HIGGINS offers **FREE** this unique, authoritative aid to draftsmen and teachers of Mechanical Drawing

This 30-page booklet on "Drafting Standards Accepted and Proposed" is free to professional draftsmen and teachers of Mechanical Drawing who formally request copies on their *Company* or *School letterheads*. It is available to others at 25c per copy.

It contains a professionally correct exposition of drafting standards in sketches and written instructions, including a page of proposed standards not to be found elsewhere in printed form, and a chapter giving the latest official welding symbols. For more aid to *you*, write for a copy today.

HIGGINS

HIGGINS INK CO., INC. • 271 NINTH STREET, BROOKLYN, N. Y.

Tested Instructional Projects

—These projects have all been shop tested for school use

Knurling on the Lathe

IN general metal work, a very common operation is knurling a cylindrical surface on the engine lathe. The tools necessary are a lathe dog, knurling tool, a six-inch scale, oil pan, and brush or oil can.

The procedure is as follows:

1. Knurling usually follows a straight turning operation. The work is in the lathe, between centers, with a dog clamped on one end of the work. If not, clamp on the dog and adjust the work between lathe centers. (See sketch.)

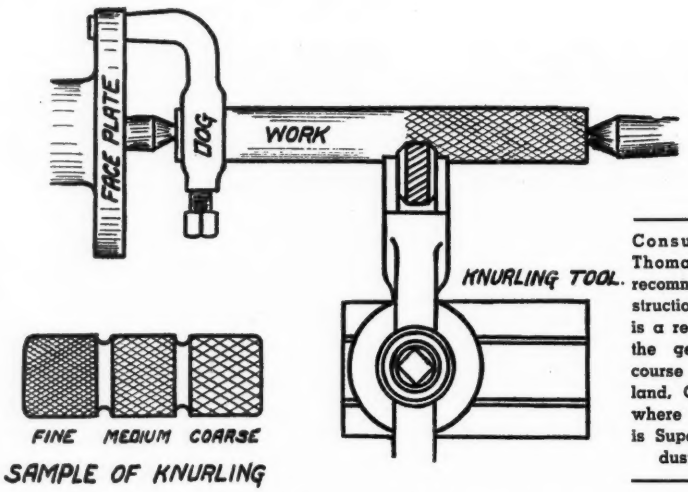
2. The lathe speed and feed for knurling should be equal to that used for rough turning of the same diameter.

3. Place the knurling tool in the tool post and adjust the elevation so that both knurling wheels will have an equal pressure on the work. Also have the knurling tool set at right angles with the work.

4. Start the lathe, being sure that revolving parts have clearance. Considerable pressure is required to force the knurls into the work. One-eighth to one-quarter turn of the cross feed handle after the knurls touch the work is usually the amount of pressure needed. Use plenty of oil.

5. Stop the lathe after five or six revolutions and examine the knurling. If the impressions are not clean cut and sharp, apply more pressure and try again.

6. When the impressions the width of the knurls are sharp, the longitudinal feed is engaged. Usually one feed across the work is sufficient for knurling.



Consulting Editor Thomas Diamond recommends this instruction sheet which is a regular part of the general metal course of the Cleveland, Ohio, schools where Frank Moore is Supervisor of Industrial Arts.

A Toy Electric Motor

THIS toy electric motor is made from inexpensive, easily secured materials. Construction is simple and if instructions are followed, an electric motor that runs can be assured. It is designed to operate from a single dry-cell battery. As it operates at a low speed, the basic principles of the electric motor can be easily studied. The different armatures, with their ease of interchangeability, add to its educational value. It was designed by the Rural Electrification Department of the Westinghouse Electric Co.

Vern Williams, industrial arts teacher in the Pattengill Junior High School, Lansing, Michigan, told the editor that he found this project especially valuable with his ninth-grade students as an extra after the regular series of jobs had been completed.

Material Required

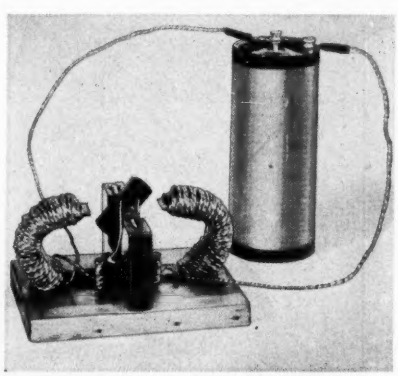
1 wood block 2⅛" by 4½"
1 wood block 4½" x 6"
1 11½" length of ⅛" thick x ¾" wide soft iron (strip steel)
1 (or more as required) 1¾" length of same iron as above
1 (or more as required) 16-penny common iron spike nails
2 4-penny common iron nails
2 No. 8 1¼" long, round-head wood screws (iron)
1 length of 6', ¾" wide friction tape
1 length of 6', cotton wrapping string
1 ½ lb. coil No. 18 bell wire (annunciator wire) (approximately 75' all in one length)
1 1½ volt dry cell battery (No. 6 preferred)

Preparing of the Parts

Base.—The large wood block is used for the base of the motor and requires no further work.

Bearing Block.—The bearing block should be made from the small wood block as shown in figure 1. The notch in the bottom, ¾" wide by ⅛" deep, should fit the iron. Friction tape may be used between the wood and iron if needed to make the iron fit closely.

Field Poles.—Bend the long piece of iron to the shape shown in Fig. 2, keeping the dimensions as close as you can to those in the diagram. (Variations



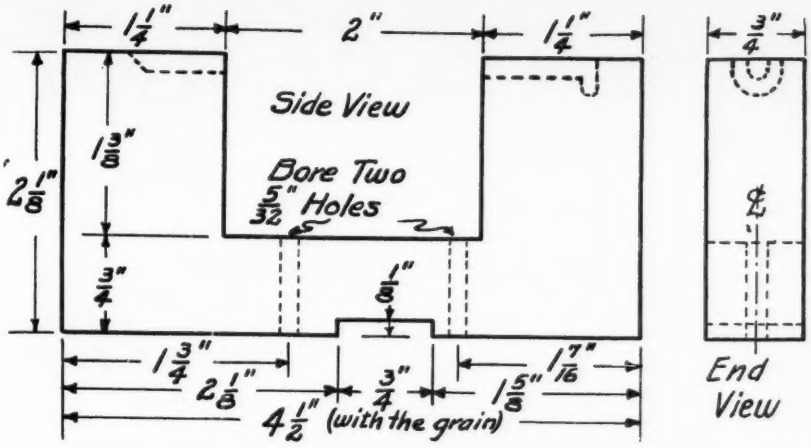


Fig. 1—Bearing block (soft pine wood).

in the bending are permissible as long as the space between the poles is two inches and as long as each pole is two inches from the bottom.)

Find the center of the iron and mark a line with a pencil 1½″ each side of the center for the flat 3″ straight section at the bottom. Then bend iron between these marks and the ends of the iron. This can be done by putting the iron in a vise and using a monkey wrench, forming iron around a rod or pipe, or bending iron with a hammer on a block of wood.

Armature Iron. — Armature iron should be made as shown in Fig. 3. Use the same material as for field poles. The number required will depend on the number of armatures made. A full set will require six.

Armature Shafts.—The spikes to be used for armature shafts should be alike and should be straight, with uniform heads. Remove tool marks from the heads with a file or emery cloth, and also any irregularities or enlargements near the points of the spikes.

Assembly.—Fasten the field poles to the center of the base with the bearing block, held by the two wood screws. To make the armature bearings, center a spike across the bearing block and mark the location for the head of the spike. (Note: The field pole iron is closer to one bearing than the other. The head of the spike must be on this "closer" bearing.) Heat the spike and "burn in" the head into the block. Do the same for the point end, repeating the process until the spike has burned a bearing as deep as the diameter of the spike. Rotate the spike while burning. After burning, add a few drops of light oil.

Winding the Field Coils.—With the field pole iron still in place, wrap the places where coils are to be located with friction tape. An 18″ length, lapping half of the width of the tape at each turn, is required for each pole.

A ½ lb. coil of No. 18 Bell Wire will vary in length. If a motor with four armatures is to be made, the following lengths of wire are required and can be cut from a ½ lb. coil:

1—3″ for commutator of Fig. 5 armature.

1—11 ft. for winding of Fig. 6 armature.

2—3″ for commutator of Fig. 7 armature.

2—30″ for windings of Fig. 8 armature.

2—28 to 30 ft. for winding field coils.

Allow 12″ for battery "lead." Starting at the base on either pole, wrap the wire in a clockwise direction. Lay each turn as close as possible, continuing to within ½″ of top. This should take approximately 40 turns. Before the last three turns are applied at top, put a 1″ length of tape under the wire folding the tape back over the windings when the return layer is started. Add the second layer, laying the turn as closely as possible until you reach the base again. This should take approximately 36 turns. Repeat by laying on the third layer up, and the fourth layer down. Each will take approximately 30 turns, making a total of about 136 turns. A few turns more or less, depending on accuracy of applying and length of wire, will do no harm. The finish wire should be wrapped around the 4-penny nail which is driven into the base, ½″ from both the iron and the bearing block. This nail serves as a "brush" holder, and the end of the wire with the insulation removed, forms the "brush." The other winding is applied in a similar manner, allowing a 12″ battery "lead" and winding in a clockwise direction. (Fig. 4.) The "finish" wires in each case should be 12″ long, and each should go to one of the 4-penny nails. The "start" wires go to the battery terminals. "Brush" wires are spaced about ⅜″ apart at the top.

Many of the construction details of the four types of armatures shown are

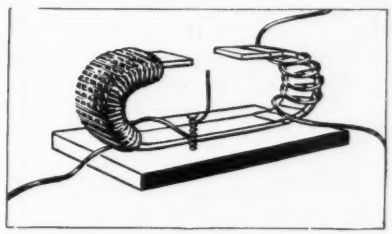


Fig. 4.

common to all. The one shown in Fig. 5 is the simplest and will be described in detail first.

Two-Pole Armature.—With the point of the spike reduced in size to eliminate the "swell" due to manufacture, it can easily be driven through the hole in the armature iron (Fig. 3). The head of the spike should extend 1⅝″. 2⅜″ from the head, wrap four layers of ¾″-wide friction tape on the spike, for the commutator. Remove the insulation from a 3″ piece of No. 18 wire and make the "bars" for the commutator. (See Fig. 9.) This is really only a short circuiting device. *Important:* These bars must be located on the spike so that they are in line with the "leading" edge of the ar-

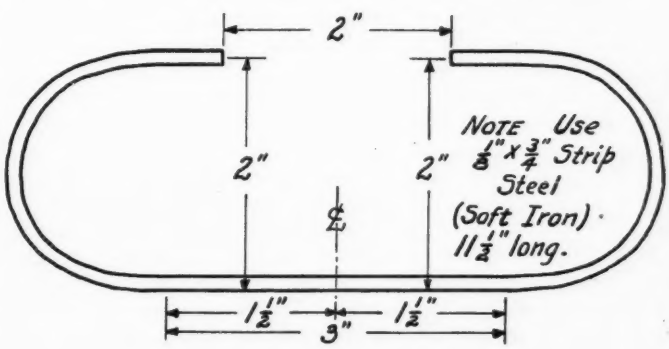


Fig. 2—Field poles.

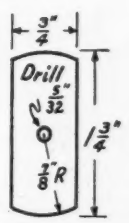


Fig. 3—Armature iron.

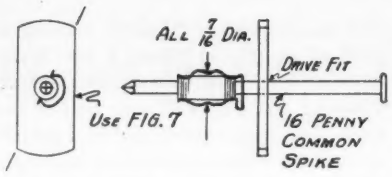


Fig. 5—Two-pole armature (no winding).

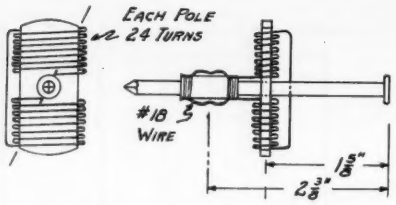


Fig. 6—Two-pole armature with winding.

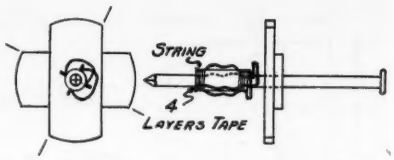


Fig. 7—Four-pole armature (no winding).

mature iron as shown in Fig. 5. They should also be opposite each other on the commutator and extend the same distance out from the spike. Long-nose pliers will make the work easier. Several strands of string will hold the "bars" in place. Overall diameter of the bars should be 7/16".

Two-Pole Armature with Winding.—Fig. 6 armature is same as Fig. 5 except that some No. 18 wire has been wound on the armature iron.

To wind the armature shown in Fig. 6, first cover the armature iron where the winding is to be applied with at least one thickness of friction tape. This insulates the iron as well as holding the

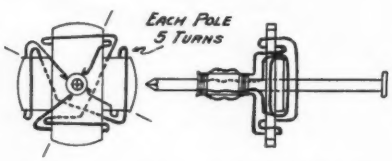


Fig. 8—Four-pole armature with winding.

windings in place. Starting at the center of the armature, allow 2" for making a commutator bar, then apply the windings in the direction shown. The first layer will take 7 or 8 turns. A one-inch length of friction tape applied under the last two turns and folded back over the first layer will be helpful in holding the start of the second layer of windings.

The second layer will require eight turns. This winding should continue past the spike to the other pole of the armature. The same direction of winding and same number of turns and layers will thus be applied on each side. Repeat the process, applying the third and fourth layers. Thus a total of 24 turns per pole can be made from the 11′ of wire required. More or less turns per poles is permissible, but each pole should have the same number to maintain a proper balance. The "start" and "finish" wires will come automatically in about the correct position to be used for commutator bars. Fig. 9 shows how to make the bars.

Four-Pole Armature.—Fig. 7, the 4-pole, no-winding armature, is essentially the same as two armatures like Fig. 5, on a common shaft. Opposite commutator bars are formed by the same wire, but the pairs are insulated from each other. Two pairs of commutator bars made as shown in Fig. 9 will be required for the Fig. 7 armature.

Four-Pole Armature with Winding.—Fig. 8 armature is essentially the same as two of Fig. 6, except that five turns only are wrapped on each of the poles—each pair of poles being a separate circuit. The direction of winding is shown in Fig. 8. The "start" and "finish" wire automatically indicate their position on the commutator. All commutator "bars" should be put in line with the "leading" edge of the armature iron, as shown. Direction of winding and position of commutator bars, as well as the diameter of the commutator, are very important. Some adjustment of the "brushes" may be necessary to get satisfactory operation on a single dry cell. The entire motor and extra armatures may be painted with orange shellac. Any shellac on the brushes, commutator, or bearings should be removed.

Operation

All four armatures are easily interchangeable and will show different operation characteristics. Those with windings will be more powerful, and those with four poles will operate more smoothly. More than one dry cell can be used, and if they are connected in "series" the motor will run faster and be more powerful.

However, the motor is not designed for high-speed operation. Being a series-type motor, it will operate on alternating current from a toy transformer as well as on direct current (dry cells). While it will run on alternating current, there is danger of overheating the windings in the motor and toy transformer, as such toy transformers are of too high voltage. Using a rubber band for a belt, this motor can be made to operate small toys.

This motor rotates in a clockwise direction as viewed from commutator side. Interchanging battery leads does not change direction of rotation. Direction of rotation is determined by the relative position of the armature and the field poles when the electric circuit is made. Interchanging leads does not change this relative position. It merely changes the direction of the magnetism caused by reversing the direction of the electricity. Were it not for this feature, vacuum cleaner and other household motors might run backwards.

Principles of Motor Operation

Many of the fundamental principles of the electric motors are found in this toy motor. These can be explained by removing the armature, and closing the

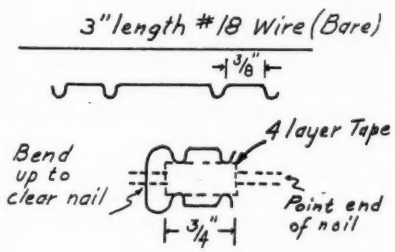


Fig. 9—Commutator details.

circuit by pushing the brushes together. The presence of the electric circuit is shown by the spark which occurs when the brushes part. If the point of an iron nail about 1½" long is touched to the end on one of the field poles and the electric circuit closed by touching the brushes together, the nail will be held suspended between the two poles. When the electric circuit is broken, the nail will fall. If the circuit is again made with the nail across its original position, it will jump back in line across the gap between the two poles.

Thus we see the presence of the two fundamental circuits in all electric motors—namely, the electric circuit where the electricity flows, and the magnetic circuit where the magnetism flows. Without the electric circuit we would not have the magnetic circuit, and without the magnetic circuit no motor would be possible.

If the nail is fastened to a shaft and held between the poles, slightly out of line, when the electric circuit is made the nail will rotate into line. Opening the electric circuit at the right time would allow the armature to roll like a fly wheel. Repeating this process

(Continued on page 18)

TAKE A LETTER AT ONCE, MISS JONES!

No. 252-27-H

Shop Bench 8′ long, 27″ wide and 32″ high. Top 2¼″ Edge Grain Maple. Three drawers inside 14 5/16″ x 18¾″ x 7¼″. One cupboard inside 16¾″ x 21″ x 24⅜″ high.

No. 180-24-DS

Shop Bench 8′ long, 24″ wide and 32″ high. Top 2¼″ Edge Grain Maple. Two Drawers inside 10¼″ x 17¾″ x 4⅞″.

Gentlemen: Please mail us your catalog on Benches and Drafting Tables---We are enlarging our Vocational Department to provide capable men for local Defense Industries.

. . . Or better still, ask us to have one of our Sales Engineers call on you. During the past 18 months Sheldon men have equipped many Army, Navy and Industrial projects and as a result can bring you first hand knowledge of defense-vocational requirements.

You assume no obligation for Sheldon planning which can provide you a valid and valuable service pertaining to layout, budget estimates, and specifications. Write today requesting catalog or personal sales contact.

No. P-611

Drafting Table 42″ x 32″ x 38″ high. No. P-612 same as P-611 but 34″ high. No. P-613. Mechanical Drawing Table 36″ x 24″ x 34″ high.

E. H. SHELDON & CO.

MUSKEGON 731 NIMS ST. MICHIGAN

Get this timely help for APPRENTICE TRAINING of Tool and Die Makers

Now widely used in many vocational and trade schools throughout the U. S. Meets urgent need for a complete, up-to-date text. The shortage of tool and die makers must be met fast by men who know the "whys" and "hows." This book gives them both and more. It shows how to select tool steel; how to make tools; how to avoid trouble; how to improve tool performance. Read on the right what school heads say about this modern text.

TOOL STEEL SIMPLIFIED

By Frank R. Palmer
A Vice-President of
The Carpenter Steel Company
315 pages — 205 illustrations
$1.00 postpaid in U. S. A. Elsewhere $3.50

Read What Other School Heads Say--

. . . Consider it one of the very finest books that our local schools of vocational and adult education might use in training of apprentices in machine trades.

R. L. Welch
Supervisor Industrial Education
State of Wisconsin

. . . Valuable textbook for apprentices and journeymen, and an equally valuable handbook for tool designers and others concerned with the use of tool steel.

J. B. Chalmers
Director of Training
The Yale & Towne Mfg. Co.

. . . Simple and easy to read. Contains useful information which commends it to technical men, semi-technical men, and men in the shops who want to improve their ability to make the best use of tools.

Prof. Bradley Stoughton
Dept. of Metallurgical Engineering
Lehigh University

. . . have read and re-read the book. Became absorbed in finding out and learning so many things I never knew before. Chapter 17 on quenching is worth the price of the book . . . will need 45 copies for classroom use.

F. E. Laverty
Worcester Boys' Trade School
Worcester, Mass.

Low price of $1.00 per copy makes it economical for student use. Elementary enough to meet the urgent need for a good text for apprentice training. Practical enough to be helpful in advancing the skilled tool maker. Contains hundreds of practical suggestions that can be quickly applied in daily work to get improved tool performance. Send coupon on right for free descriptive leaflet, or order a book for examination.

SEND Now

The Carpenter Steel Company
Dept. 16A
Reading, Pa.

Send me free leaflet describing contents of "Tool Steel Simplified."

NAME_____ TITLE_____
(Please Print)

SCHOOL_____
(School Name Must Be Given)

STREET_____ CITY_____

☐ I enclose $1.00. Send copy of book postpaid.

Making Rope from Binder Twine

By Raymond S. Orr

ROPE of excellent quality can be made on the farm from binder twine. The process is not at all difficult and the equipment necessary can be made from scrap material in the farm shop. Rope of various sizes and lengths is always in demand for halter ropes and many other uses on the farm. Quite frequently there are odds and ends of binder twine left over from harvest which can be converted into rope. The cost of binder twine by weight is usually about one-third to one-half the cost of factory-made rope.

The quality of rope made from binder twine, if the work is done with reasonable care, is equal to the better grades of rope on the market. The hardness of twist is at the discretion of the maker. Any size rope can be made, depending only on the number of strands of twine used. Following is a description of the equipment and an explanation of the processes of making and using it.

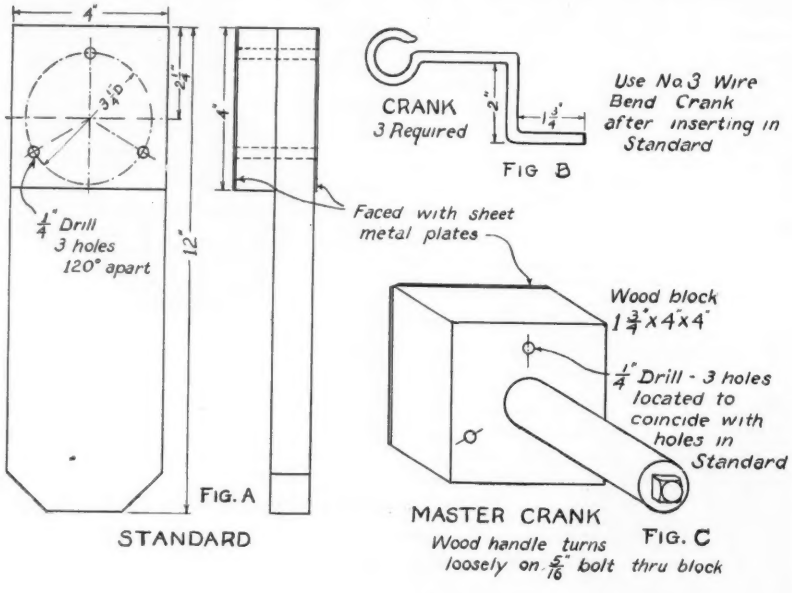
The pieces shown in Figures A, B, and C made up the working head or strand-twisting device. The standard, Figure A, is made of a twelve-inch length of 1" x 4", with a 1" x 4" x 4" block fastened to its face at one end. Any wood may be used. Both front and back are faced with sheet iron, as wood alone wears rapidly. The sheet iron and blocks are fastened together with screws or rivets sunk flush with the surface. The holes through the standard to take the wire cranks must be carefully located. A 3¼" circle is scribed on the face and the holes located on this 120 degrees apart, one at the top. The holes should be drilled with a ¼"-bit in the drill press as they must be perpendicular to the surface. The cranks are made of No. 3 wire and the square bends are made after the wire is inserted in the holes. It is important that the arms of the cranks be of the same lengths. The handle of each crank should be no longer than the thickness of the block used for the master crank.

The master crank consists of a 1¾" x 4" x 4" wooden block, faced with sheet iron, and with a wooden handle attached at the center of the back. The handle is fastened by a bolt through the block with a nut on each side, both counter sunk. The handle then turns freely on the bolt. The holes through the block to take the wire crank handles must be located the same as the holes in the standard. In use, this master crank turns the three small cranks simultaneously.

The strand separator, Fig. D, serves as the tail piece in the strand-twisting operation. This piece is forged from ¾" round iron. The drawing shows its shape and measurements. The notches may be made after the piece is forged to shape, by drilling near the edges with a ½ to ⅝" bit and filing out the corners. The notches should be located 120 degrees apart to correspond to the location of the hooks in the standard. The hook, Fig. E, is forged from a 7" piece of ⅜" iron. The end should be upset, squared, and forged with a good shoulder, so that it will be gripped securely in the chuck of a hand brace.

To use the apparatus the standard is fastened upright in a bench vise. The bench must be fastened down as there is considerable pull when the rope is being twisted. The master crank is placed on the back of the standard with the handles of the wire cranks in their proper holes. One man stands at this end to manipulate the crank. Another man holds the strand separator on a level with the cranks and far enough away to give the length of rope desired. The finished rope will be about one-fifth shorter than the length of strands used. Figure F shows the method of threading the binder twine on the end pieces. A third man must do the threading. The beginning end of the twine is held by the man at the tail end, and the twine is carried forward through the top notch (No. 1) to the top hook at the head end, around this hook, and back to the same notch at the tail. It is then taken through notch No. 2 to hook No. 2' at the head then back to notch No. 2. It is then taken across to notch No. 3 then to hook No. 3' and back to notch No. 3. As many strands of binder twine may be used as desired. Six strands on each hook will make a rope about one-half inch in diameter. Be sure that all hooks have the same number of strands and that all strands pass around the hooks in the same direction. The last strand comes back to the tail through No. 3

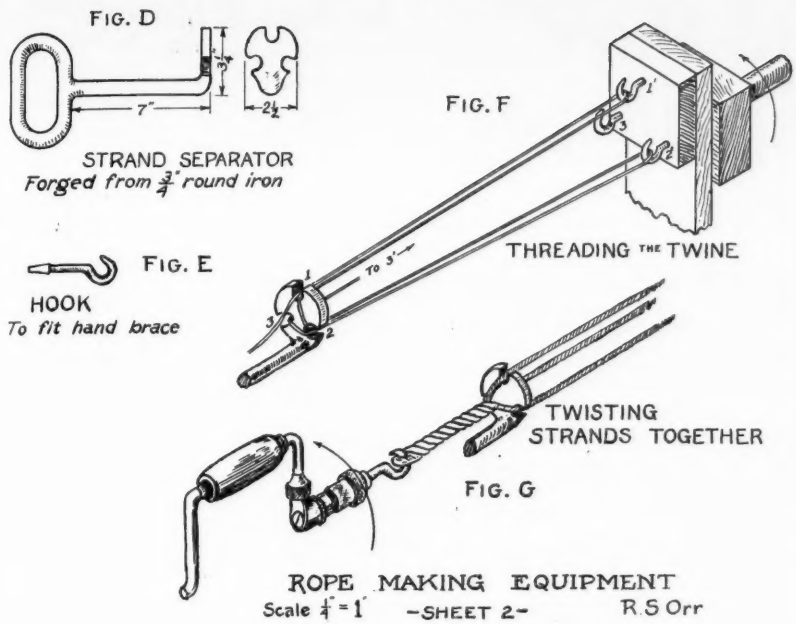
Mr. Orr, who is now with the Vocational Division of the Wyoming State Department of Education, taught farm shop at the Douglas, Wyoming, High School where he developed this project. Not only does it illustrate the method used in making rope, but also has great practical value for farm boys because of the odds and ends of binder twine usually found around the farm following the harvest which can be made into usable rope.



DETAILS of STRAND TWISTING DEVICE
ROPE MAKING EQUIPMENT

Scale ½"=1"

R.S.Orr



notch and is tied to the loose end of the first strand.

The man at the head end then begins turning the crank. The strands are thereby twisted in three separate bundles. As the strands are being twisted, the man at the tail must maintain a strong steady pull. The more the strands are twisted the harder will be the finished rope. When the strands are twisted until they show a strong tendency to kink, the hook in the brace is slipped through the ends of the strands as they loop over the separator piece. The man with the brace then begins to turn the brace with a counter clock-wise motion bringing the strands together into rope. The separator piece is slipped forward slowly and the strands are watched carefully to see that they lie down smoothly on the rope. The man at the head continues to crank slowly to keep up the twist tension in the strands. The man with the brace must exert considerable pull backward as he turns the brace to make the strands lie smooth and even. A rope or belt around his back and tied to the head of the brace will help him to maintain this pull.

When the laying up process has reached the cranks, the end is finished by carefully removing each strand loop from its hook, laying the three loops together, and slipping the other end of the rope through these loops and pulling tight. The rope then has two finished ends that do not require tying in any way. The loose ends of fiber that stand out along the rope may be singed off and the rope is complete.

Patronize SCHOOL SHOP *advertisers.*

A Prize-Winning Telescope

(Continued from page 9)

quired in their classes. Mathematics, science, English, history, art, the library, and the industrial arts, all play a part in the big job. Such an undertaking would be a factor toward the unification of the different school departments as they cooperate to achieve a goal. Students will realize the interdependence between their many courses.

We found parents and townspeople to be our greatest boosters. Fathers dropped in regularly to watch the progress. Many gave us helpful suggestions. They were most gratified to see their sons follow through "book learning" by actual doing.

American Industrial Arts Association

● The American Industrial Arts Association convened in Boston, Mass., June 29-July 2, 1941, during the National Education Association convention. A series of six sessions and a continuous exhibition of adult handicrafts comprised the program. The exhibition was held in the showrooms of the Boston Society of Arts and Crafts. The meetings opened with a preliminary conference of the Liaison and Advisory Board of the association which is made up of representative leaders from education, labor, industry, business, government, and the museums who advise concerning the policies and programs of the association. A luncheon session sponsored by the New England Industrial Arts Association and a banquet session sponsored by Epsilon Chapter of Epsilon Pi Tau were highlights of the convention. Dr. Louis V. Newkirk is president-elect. Membership in the association, which has departmental status in the NEA, is $1. Address: 185 Broadway, Newark, N.J.

NEW MAKE LINK OR BRAIDED BELTS
Just Out 1941 Edition

FREE HANDBOOK
Complete instructions for 72 educational, leathercraft projects. Many just introduced. No tools, for most items. From 5 cents up. No obligation. Send today.
HORTONCRAFT
663 Capitol Ave., Hartford, Conn

TEACHERS
For correct copy, be sure to give grade you teach.

AVIATION MECHANICS

Two reel 16 mm. Silent Motion Pictures for use as visual teaching aids.
THE MAKING OF
AN AIRPLANE FITTING
AIRPLANE WELDING
AIRPLANE RIVETING
AIRPLANE SHEET METAL WORK
These films for rental or sale. Other vocational training subjects. Write for catalog.
WALTER O. GUTLOHN, Inc.
35 W. 45th St., Dept. L, New York, N. Y.

WORK with *Plastics*
In *Your* School Shop
● TEACH your students to work with *Plastics,* the increasingly important material of the future. Plastics are easily worked with ordinary school shop tools. *"Craftsman" Plastics* are available in numerous colors, in sheets, rods, cylinders, and special castings.
● *FREE to Instructors*—write today for our booklet and price list.
Craftsman Supply House
Dept. S. Scottsville, New York

Teacher-Trainers
SCHOOL SHOP can serve as excellent supplementary classroom material in a teacher-training program. There is a special rate for group orders sent to prospective teachers.
●
Write for details to
Circulation Department
SCHOOL SHOP
Box 100, Ann Arbor, Michigan

GENERAL SHOP ELECTRICITY
revised
● by Dragoo & Dragoo. Fundamentals. Write for approval copy to Dept. S1, McKnight & McKnight, Bloomington, Ill.

NEW SANDER READY!
Here is the ideal, inexpensive tool for school shops—just out. Mead's sensational new BANDSANDER quickly shapes, carves, sands, and polishes WOOD, METAL, and PLASTIC PROJECTS! Cute fast and clean on ENCLOSED EDGES, intricate scrolls, curves. Tilting table. Saves hours of tiresome hand work. Does better job. Nothing else like it! Order yours now only $14.95 FOB Chicago. Try it 5 Days, then, if not perfectly satisfied, return it and we'll refund your money promptly!..... $14.95
FREE! Or write for Free Circular describing, illustrating how this amazing new BANDSANDER invention saves time, money, trouble. Write now—a postcard will do!
MEAD SPECIALTIES CO.
15 So. Market St., Dept. 10-S, Chicago, U.S.A.

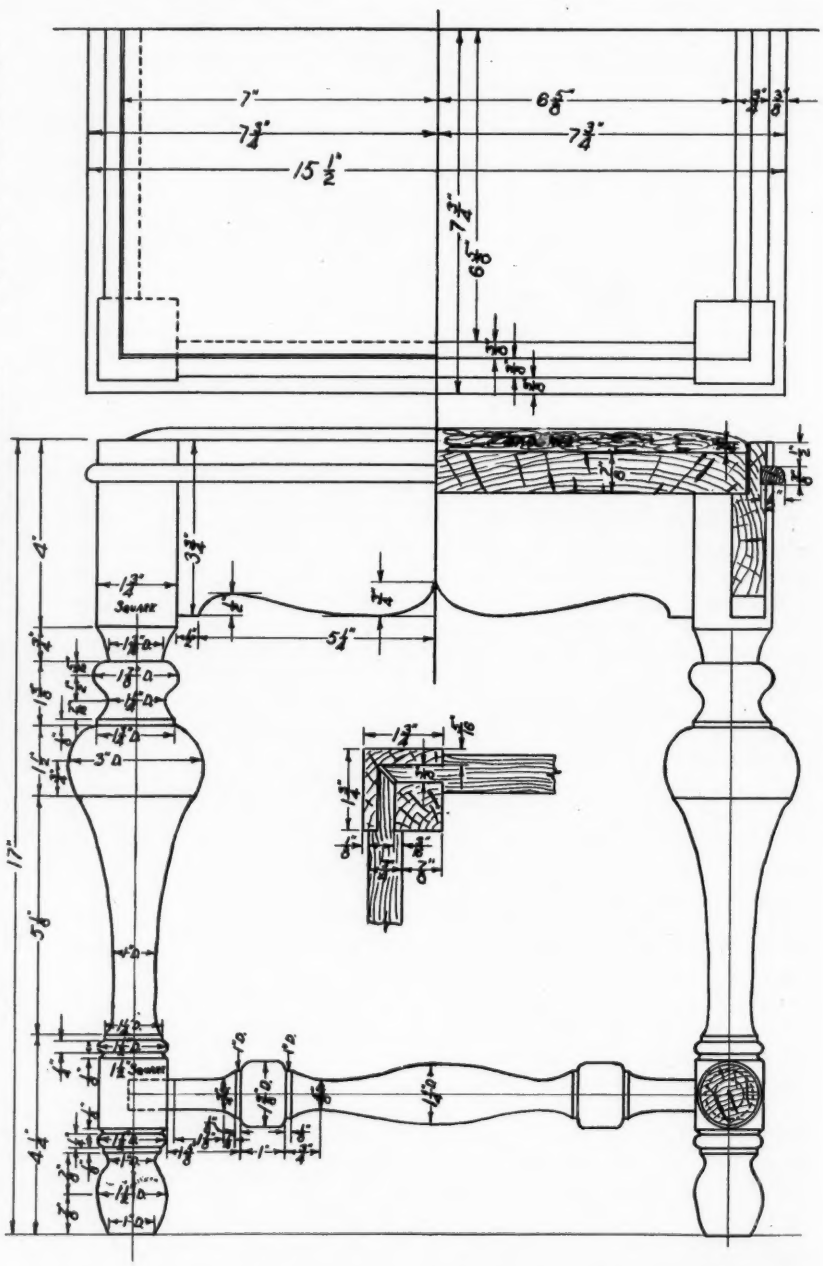
A William-and-Mary Dressing Table Bench

by **Earl W. Boyer**

Mr. Boyer is an instructor in machine design at the Dobbins Vocational School, Philadelphia, Pennsylvania.

THIS is primarily a turning project, but the bench also affords some practice in joinery and in upholstery.

The photograph was taken before the upholstery was applied, but it shows the removable seat board to which the padding and covering are attached. Mahogany or walnut may be used very effectively. Material for upholstery may be determined by the color scheme of the room in which the bench is to be placed.



Toy Electric Motor

(Continued from page 14)

at the right time is difficult by hand, so an automatic device to "make" and "break" the electric circuit at the correct time is fastened on the rotating shaft. This is what we call a commutator.

The motor runs because the electric circuit makes the magnetic circuit. The magnetic circuit has a movable section which is out of line and wants to rotate into line.

AVA Convention

● Increased public demand for all types of vocational education and industrial arts services through the public schools will claim top interest with the growing need for all-out defense job training in program presentations at the 35th annual convention of the American Vocational Association December 10 to 13 in Boston, Massachusetts. Both topics will receive major consideration on the part of 3,000 or more delegates who will assemble for discussion of the theme "Vocational Education—National Defense—Economic Security."

L. H. Dennis, Executive Secretary of AVA, reports that members of the Massachusetts Vocational Association and their co-workers in the other New England States who will act as convention hosts have been busy for months making preparations for the annual gathering. He declares that national defense participation has now expanded actively into the fields of home economics, agriculture, business and distributive education, and vocational rehabilitation, as well as industrial and industrial arts education. The convention program for each of these sections will be arranged with three major objectives in view: national defense; expansion of the present vocational and industrial arts programs; consideration of a long-term program of education for work that will lead to the period following the present national defense emergency and Demobilization, or D-Day.

INSTRUCTIONAL RESOURCES

BOOKS

How To Train Shop Workers. C. A. Prosser and P. S. Van Wyck. Chicago: American Technical Society, 1941. Pp. 126 (mimeographed). $1.25.

A manual for instructors in the training of workers for industrial production and service jobs. In six parts: The Foreman's Duties and Responsibilities; Planning What Training to Give the Worker; Finding What to Teach by Job Analysis; Methods, Procedures and Devices . . . ; Training the Worker Right; The Foreman as a Human Engineer. Charts, questions, and bibliography.

C. A. Prosser is director, the Dunwoody Institute, Minneapolis, Minn.; Philip S. Van Wyck is head of the metal trades department at Dunwoody Institute.

General Shop Electricity. A. W. and K. L. Dragoo. Bloomington: McKnight & McKnight, 1941 (revised edition). Pp. 124. $ .80.

Five units: simple wiring circuits, battery connections and testing, low and high voltage lighting current, high voltage and house lighting, and wiring with nonmetallic cable. Each unit containing questions on each fundamental operation and a section devoted to general information related to the topic of the unit. Unit five contains 25 projects, from the making of a simple electric cell to a three-tube all-electric radio. Reference list; index.

A. W. Dragoo is in the department of industrial arts at Illinois State Normal University, Normal, Ill. Kenneth L. Dragoo is director of the radio division and radio broadcasting, Samuel Gompers Trade School, San Francisco, Calif.

General Shop Woodworking. V.C. Fryklund and A. J. LaBerge. Bloomington: McKnight & McKnight, 1940. (Revised edition.) Pp. 152. $ .80.

A detailed discussion of what the woodworker should know and be able to do, with each technique illustrated step-by-step and followed with questions on the unit. Also included are suggested projects, units on how nails are made, lumber and lumbering, design, occupational opportunities, a shop library reference list, and index.

Verne C. Fryklund, Ph.D., is professor of industrial education, University of Minnesota. Armand J. LaBerge is instructor in industrial arts, Bryant Junior High School, Minneapolis, Minn.

Blueprint Reading, Checking, and Testing. Otto A. Steinike. Bloomington: McKnight & McKnight, 1941. Part I, the instruction, $1.20; part II, the blueprints, $ .80.

This course is printed in two books, the first containing the instructional material, to be used over again, and the second, containing the blueprints, which must be marked up by the students, to be used only once. The exercises progress from a notched block and a planer stop in plates 1 and 2, to an air-cooled piston and front hub-member in plates 38 and 39. Otto A. Steinike teaches mechanical drawing at Beaver Dam, Wis., High School.

Principles and Techniques of Vocational Guidance. George E. Myers. New York: McGraw-Hill Book Company, Inc., 1941. Pp. xii+377. $3.00.

A delineation of the eight services that comprise vocational education as differentiated from the field of guidance as a whole, with a discussion of techniques and methods. Of especial value to shop teachers interested in the vocational guidance aspects of their programs. Bibliography with each chapter; index.

Dr. Myers is professor of vocational education and guidance at the University of Michigan and Editorial Advisory Board member of SCHOOL SHOP.

Essentials of Shop Mathematics. Slade and Margolis. New York: John Wiley & Sons, Inc., 1941. Pp. viii+194. $1.50.

Intended as a basic text in mathematics used in trades most commonly taught in vocational and trade schools and classes. Chapters on mensuration; automobile mechanics; electricity; machine shop; printing; sheet-metal work; and woodwork. Covers the fundamental mathematical phases of each of the above trades with explanations, diagrams, and problems introduced with completed examples. Indexed.

Samuel Slade, B.S., C.E., is administrative assistant, New York Vocational High School; Louis Margolis, A.B., C.E., teaches at the Brooklyn High School for Metal Trades, New York City.

Interior Electric Wiring and Estimating. Uhl, Nelson, and Dunlap. Chicago: American Technical Society, 1941 (Third Edition). Pp. 354. $2.50.

Covers service wiring; knob and tube wiring; cable wiring; conduit wiring materials, tools, and methods; as well as special chapters on apartment building and factory wiring and on estimating. Well illustrated with halftones and drawings. Indexed.

Albert Uhl is an electrical contractor and member of the Chicago Electrical Estimators Association. Arthur L. Nelson was formerly superintendent, interior wiring department, Commonwealth Edison Co., Chicago, and member of Western Society of Engineers. Carl H. Dunlap is head of the electrical engineering department, the American School, Chicago, and associate member, American Institute of Electrical Engineers.

BOOKLETS

Drafting Standards Accepted and Proposed. Higgins Ink Co., Inc., New York. Free to professional draftsmen and teachers; others, 25 cents. 30 pp.

This booklet sets forth accepted drafting standards in sketches and written form. In addition, there is a page of proposed standards not to be found elsewhere, and a chapter on welding symbols. The booklet is widely used in drafting rooms of many of the nation's largest manufacturers, both in defense and nondefense work. Address Higgins Ink Co., Inc., 271 Ninth St., Brooklyn, N.Y.

(Continued on page 23)

CASCO brings simplified industrial gluing to your shop!

● Now your students can make the same durable, foolproof, CASCO-glued joints obtained in leading industrial plants. CASCO adhesives save class period time, eliminate glue-pot fuss and assure you the right glue for *all* types of projects. Sold in Hardware Stores in all handy sizes.

STAINFREE, WATERPROOF, INSTANT MIXING

For veneering acid or light woods—for boats, garden furniture, sports equipment. CASCAMITE POWDERED RESIN GLUE opens the entire field of outdoor projects.

FOOLPROOF, EASY-TO-USE, WATER RESISTANT

For interior use. CASEIN CASCO POWDERED GLUE mixed in cold water, makes heavy duty weight-bearing wood joints. Ideal for beginners' not-too-perfect workmanship.

GLUES THE NEWER WORKSHOP MATERIALS

Sticks to metals, plastics, glass, fabrics. CASCO FLEXIBLE CEMENT withstands jolts and expansion of dissimilar materials. Ready to use.

FREE! GLUING "TEXT-BOOK"

Tells what glue to use. Includes complete mixing directions, liquid life, setting time, veneering, overlays, inlays. 36 pages, 56 illustrations. Covers all Casco glues.

SEND FOR YOUR COPY TODAY!

CASE N COMPANY OF AMERICA, Dept. S. S. 1041
350 Madison Avenue, New York, N. Y.

Please send my free copy of the *Casco Gluing Guide.*

*Name*_____

*School*_____

*City*_____ *State*_____

Save 2c . . . Stick coupon on penny postcard

What Do You Think?

Should school printing shops be used for the production of schools forms?

▸ Says Fred W. Miller, director of the School of Printing, Masonic Home and School of Texas, Fort Worth:

The production problem in schools has long been a sore spot here in Texas.We have just completed a survey of the printing industry and vocational training in the city of Fort Worth. A principal objective was to correct the "production problem" as painlessly as possible. Our local schools are under Smith-Hughes; therefore in accordance with the Texas State Plan for Vocational Education, "three hours per day of the learner's time is given to practical shop work on a useful and productive basis." We believe that some live jobs are necessary to the proper experiences of printing students, but these jobs *must always* serve the student, and the student must never be exploited to serve production.

Teachers under no circumstances should be required to do composition or presswork themselves, except for demonstration purposes. And the teacher should be privileged to reject such production as cannot be used for actual instruction and which requires experience and skill which cannot be reasonably expected of the student. We believe that beyond this point production work prevents achieving the true aims and objectives of a trade-preparatory course; it interferes with the continuity of instruction and exploits the student; it denies to the student not engaged on the job the attention that the teacher should give him in the process of regular instruction, and provides a hazard to such pupils because the teacher's attention must be withdrawn and centered on the work in progress. Because of a student's limited experience, the product is usually of poor quality and it develops in his mind a false concept of his ability. In my opinion no production work having a commercial value should be attempted in other than a trade-preparatory school.

In the institution that I represent we do a sizable volume of production work for Masonic organizations throughout the state. We are obliged to do so because it is from the proceeds of this work that we operate and maintain our School of Printing. We have three instructors on our faculty and seven journeymen who handle our production work; therefore production work does not conflict with our training program.

▸ Says Harold H. Kirk, instructor of printing, Langley Junior High School, Washington, D. C.:

School printshop procedure should be predicated on the philosophy and objectives of general education which in no way include or infer the exploitation of the individual. The shop, then, should not be used as a production plant except when the job is very simple and a definite part of the planned and spontaneous activity of the individual boy. A mathematics class would hardly be expected to keep and balance the school budget as part of the course of study. Neither should adolescent boys be exploited by turning out complex forms for the front office far beyond their shop experience, ability, or interest.

However, play programs, dance tickets, and the school paper (when it is linotyped outside of school) may be used sometimes as integrating factors in the youngster's school life. Difficult and involved long-run school or community jobs should not be substituted for real activities. Too many instructors are willing to substitute production for an honest-to-goodness overview of the graphic arts. A planned program does not *use* the boy's time but gives him a broad and even national outlook of his subject and its relation to him and his friends.

▸ Says Ward W. Swain, printing instructor, Washington Vocational High School, Pittsburgh, Pa.:

1. Should a printing instructor, in order to gain the ultimate objective of his course of study, be able to *control* the school form production which goes through his school shop?

2. Is it true as is so often said, that some school boards, or their administrative officers, lose sight of the fact that, basically, there is a real and vital educative justification for the school printing department?

3. Is the printing instructor the most competent person in the whole school personnel to determine the *control* of the production of school forms?

4. Is it true that many printing instructors gear their courses of study to meet the load of printing production?

5. Who *controls* the production of school forms in number 4? From an instructional point of view, is this desirable?

6. What is the view of the employing printers toward the use of school printing shops in producing school forms? Is their opinion important enough to be considered?

7. If instructor *control* of school printing is desirable, would important governing factors be:

a) When can this or that job be fitted into the course of study? If it doesn't fit, shall it be refused for this reason?

b) What kind of a form is it? Can the *students* do it with the materials and equipment available in the school print shop?

c) How many of these school forms can the *students* produce and still be directly correlated with the printing course of study?

▸ Says Joseph F. Sorace, instructor, department of publishing and printing, Rochester Athenaeum and Mechanics Institute, Rochester, N. Y.:

I believe the future of printing education will be changed radically.

No longer will boys come into the print shop to set up stereotyped exercises for purposes of drill or just to complete another problem. Nor will the school shop be exploited to do production work which is produced by the instructor with the aid of a few exceptional boys with the remainder of the class left to shift for itself, pending the completion of the work. Busy work is no challenge to the ingenuity and creativeness of the boys. It merely destroys initiative, confidence, and resourcefulness. It becomes a pressing monotonous grind to produce printing under constant pressure and to meet a deadline.

While I advocate a certain small amount of production work as a consummation of a worthy, useful achievement, I do not believe an instructor should be hounded continually to do production work, thereby neglecting his course of study and individualized instruction.

Boys should be allowed time to develop a broad understanding of the tools, materials, and processes of the grapic arts industries so that they may have a better appreciation of art in printing and a more whoesome respect for books. They should be given an opportunity to produce printing material of value and which is useful and beautiful. In this fashion they will get an opportunity to obtain work experience under normal conditions, which will instill in them those attitudes and attributes of cooperation and service so essential to active participation in our democratic way of life.

I believe that the graphic arts laboratory, properly and adequately equipped and staffed by practical and progressive instructors, will achieve much to make printing education a vital factor in the conservation and development of the human material so vitally needed to make our democracy function.

Personalities

PAUL L. ESSERT, director of vocational education for the Denver, Colo., public schools and head of the world-famed Denver Opportunity School, has been elected superintendent of the Grosse Pointe, Mich., schools. . . . Among the new placements of teachers in Texas are JOE C. WINDHAM at Raymondville, PAUL P. PRIDDY at Edinburgh, JAMES MCCRARY at DeKalb, and JACK MORGAN at Jacksonville. . . . ALEXANDER A. BLACK, instructor in printing at the New York Schol of Printing, died recently at 51 years of age. . . . J. M. STERLING, head of the industrial arts department in the Libby High School, Toledo, Ohio, died suddenly last June at the age of 58. He was a pioneer in the Toledo system, having served as a teacher there for 37 years. He was active in the Western Arts Association, and was a member of the Editorial Committee of the Association. . . . DR. JOHN G. WHITESEL of the faculty of the Teachers College of Connecticut, New Britain, has been appointed assistant professor of industrial education at Miami University, Oxford, Ohio. During the summer, Dr. Whitesel taught at the Ohio State University. . . . C. E. (JIM) HIGHLEN, formerly with the Michigan State Board in Control of Vocational Education, has become coordinator of apprenticeship training in Muskegon, Mich. . . . MAURICE OVERHOLT, formerly of Adrian, Mich., is now trades and industry coordinator at Grand Haven, Mich., succeeding JOHN J. HARRIS who is now with the Michigan State Board in Control of Vocational Education. . . . ANDREW TRICHE of the University of Pittsburgh has been named state supervisor of trades and industry in Louisiana, succeeding E. G. LUDTKE. . . . HARRY S. BELMAN, director of vocational and adult education for West Allis, Wis., has been named field agent for Wisconsin for the defense education program. His successor at West Allis is ROY R. VAN DUZEE, former supervisor. . . . JERRY G. ALLEN

WOOD SHOP SUPPLIES

KILN Dried Lumber —Finishing Materials—Knocked Down Furniture—Special and Stock Panels—Furniture Hardware—Knee-Hole Desks—Cedar Chests—Glue—Finishing Materials.

Send 10c for illustrated catalogue.

Long's Woodcraft Supply

(Formerly Bauman & Long)

GOSHEN, INDIANA

Practical Textbooks

Examine Them on APPROVAL

The following modern texts have been especially prepared for school use. You can employ many of them to excellent advantage in your National Defense Program. An examination will convince you of their suitability to your classroom needs. Any books sent for 30 days ON APPROVAL inspection subject to our educational discount if retained.

How To Train Shop Workers (mimeographed)	$1.25
Machine Shop Operations (267 Job Tickets)	5.00
Machine Shop Work	2.75
Production Management	3.50
Tool Making	3.50
Machine Design	3.00
Fifty Hints for Teachers of Vocational Subjects	0.50
Interior Electric Wiring and Estimating (based on new code)	2.50
A Good Mechanic Seldom Gets Hurt (Machine Shop Safety)	0.50
Mechanism	3.50
Flight—First Principles	2.50
Metallurgy	1.50
Forging Practice	1.50
Foundry Work	2.00
Emergency Training for Essential Industries (mimeographed)	1.25
Flight—Construction and Repair	2.50

(TEAR OFF HERE AND MAIL TO US)

AMERICAN TECHNICAL SOCIETY

Drexel Ave., at 58th St., Chicago, Dept. HS—106

Please send the following texts for 30 days ON APPROVAL examination. I will either return them at the end of that time or remit less your educational discount.

Name _____

School _____

School Address _____

» City Directors «

SCHOOL SHOP has made every effort to check its mailing list for accuracy. Each shop teacher is entitled to a copy of SCHOOL SHOP (see notice on inside front cover). As a further check, it would be appreciated if you would send to the Circulation Department the names and school addresses, along with subject taught, of each of your shop teachers. Your cooperation in this regard will be much appreciated.

CIRCULATION DEPARTMENT

School Shop

BOX 100, ANN ARBOR, MICHIGAN

Every Industrial Arts Instructor Needs Our New 1942 Catalog of

"Hard-To-Get" Materials

FOR THE PAST twenty-eight years we have specialized in unusual cabinet hardware. During this period we have attained a nation-wide and enviable reputation as a source of supply on furniture hardware and devices of almost every description. Thousands of instructors, in all parts of the country, have purchased our materials and will have received our new catalog. This issue, in spite of present conditions, shows the largest line ever offered. Many new, interesting and inexpensive projects can now be made available to your classes. Send postcard today for your copy of this new catalog, free to instructors.

● **THURSTON SUPPLY CO.**

Anoka, Minnesota Dept. SS

has been elected superintendent of the Soldiers' Orphan School, Scotland, Pa. Mr. Allen has previously served as principal of the school. . . . TOM CRITTENDEN, County Supervisor of Agriculture, Wellsboro, Pa., is the newly appointed president of the Pennsylvania Vocational Association. . . . IRENE PATTERSON of the home economics department of the Pennsylvania State College, KENNETH C. CORNWELL, formerly of the Pennsylvania State College, and now of the State Department of Public Instruction, Harrisburg, Pa., and RICHARD LIGHTER, County Supervisor of Agriculture, Gettysburg, Pa., were each elected vice-presidents. J. G. ALLEN and C. H. PENSINGER were re-elected editor and assistant editor. DR. F. THEODORE STRUCK of the Pennsylvania State College was re-elected Secretary-Treasurer. . . . LESTER L. FEHR, formerly director of vocational education, Beaver Falls, Pa., has been appointed area coordinator at the Pennsylvania State College. . . . DR. STANLEY PAWELEK (Penn State, 1941) has been appointed Supervisor of Industrial Education, Baltimore, Maryland. . . . DR. EDWARD C. ESTEBROOKE, formerly director of vocational education, Bradford, Pa., has joined the staff of the State Department of Public Instruction, Harrisburg, Pa. . . . DR. F. THEODORE STRUCK of the Pennsylvania State College, who has served for some months as Consultant for Vocational Education in the U. S. Office of Education, Washington, D. C., has returned to Penn State. . . . DR. ANTHONY GOLDBERGER, Director of Vocational Teacher Education, University of Pittsburgh, taught at Clemson College, S. C., during a part of the summer. . . . DR. LINDLEY H. DENNIS, executive secretary, American Vocational Association, taught a graduate group at the Pennsylvania State College during the summer. DR. BENJAMIN H. VAN OOT, state supervisor of industrial education, Virginia; PROFESSOR G. H. SILVIUS of Wayne University, Detroit; DR. STANLEY J. PAWELEK of Baltimore; LESTER L. FEHR, recently of Beaver Falls, Pa.; J. HERBERT KISSINGER of Reading, Pa., and ERNEST GACKENBACH of the State College public schools, were among those who supplemented members of the regular staff at the summer session that has recently closed at the Pennsylvania State College.

GENERAL SHOP **Woodworking**

revised

● Fryklund & Laberge. A basic text. Write for approval copy to Dept. S1, McKnight & McKnight, Bloomington, Ill.

A Practical Shop Clean-Up Method

by George A. Willoughby *and* Duane G. Chamberlain

ONE of the problems of shop management which causes a great amount of trouble and which has a very important bearing on the general appearance and operation of a shop is that of clean-up at the end of each class period.

Questions have been raised in connection with every method attempted, including the argument by some that pupils should not be required to do clean-up work. We believe that it is an important function of industrial-arts training to teach pupils to be neat and to take an active part and a definite responsibility in keeping the shop neat and orderly. This responsibility in the school shop should carry over into the home and into the home workshop. It is clearly evident in many cases that pupils need just such experience when one sees the haphazard manner in which things are left lying around at home.

The method we have used in some of our shops for several years is illustrated to some extent by the form shown in Fig. 1. First, the shop and equipment are studied to determine clean-up items which in the case of our small general shop numbered 20. At the beginning of the course each member of the class is given the clean-up of one of these items as his definite responsibility for the duration of the course. These items are not difficult and require about three or four minutes to complete.

After all members of the class have been given a definite responsibility, they are advised to stop work and start their cleaning jobs immediately after the clean-up signal has been given. It is important that every member of the class follow this if the plan is to be successful. Then every pupil is instructed to remain at his clean-up post until it has been inspected by the instructor or a student superintendent or inspector.

It is surprising how successfully this method accomplishes the desired results in very quick order, the whole process requiring not more than five minutes.

It is possible to simply check each pupil's work and insist that it be satisfactory or to give each pupil a rating which may be recorded and changed as his work changes. Thus a pupil might be rated *A* immediately and that rating continued as long as his work deserved an *A* rating. If another pupil's work was just good enough to "get by" his rating might be recorded as *C* and remain until his work improved sufficiently to warrant a *B* or an *A*. The method of rating may be varied to meet local situations and to serve best to encourage pride in the clean-up work.

Orderliness is a virtue which may be developed through practice. This article suggests one method of providing such practice. Mr. Willoughby is Professor of Industrial Arts at Michigan State Normal College, Ypsilanti, and Mr. Chamberlain is an instructor in the same institution.

CLEAN-UP CHART

Room 9

Small General Shop

Clean-up items	Names	Rating
1. Metal tools panel		
2. Miscellaneous tools panel		
3. Woodworking benches		
4. West metalworking bench		
5. South metalworking bench		
6. South soldering bench		
7. East soldering bench		
8. Sink		
9. Plumbing bench and tools		
10. Concrete bench		
11. Finishing bench		
12. Grinder-drill press bench		
13. Sheet metal bench		
14. Electrical bench		
15. Electrical supply case		
16. Concrete form case		
17. Case beneath metal tools		
18. Wastebasket and cans		
19. Study table		
20. Window sills		

Special Items

Instructional Resources

(Continued from page 19)

FILMS

The Metal-Working Lathe and **Plain Turning.** 16 mm., sound, color; 800 feet each; showing time, 20 min. each. South Bend Lathe Works, 425 East Madison St., South Bend, Ind.

The first two of a series of 16mm sound motion picture films based on the book, *How to Run a Lathe,* have just been released by the South Bend Lathe Works, South Bend, Indiana. Produced in full color by Burton Holmes Films, Inc., these pictures represent advanced techniques for teaching lathe operation in industrial and vocational schools.

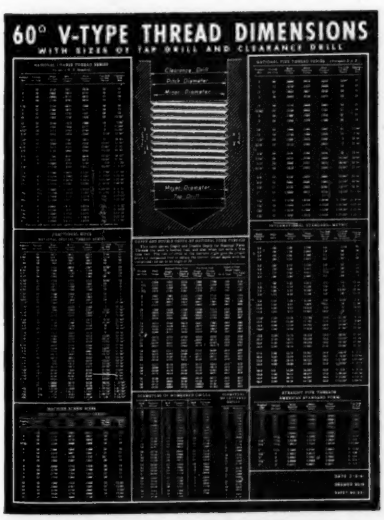
The first film, titled "The Metal Working Lathe," introduces the student to the standard back-geared screw cutting lathe by familiarizing him with the names of the various lathe parts, their purpose and operation. It is well suited for showing to beginners before they operate a lathe for the first time. After seeing the film, the student may be allowed to manipulate the various lathe controls, as demonstrated in the picture. The film may then be shown again to answer the many questions that are bound to arise after a first experience with a lathe. This method of instruction materially shortens the orientation period and reduces the amount of individualized instruction.

The second film, "Plain Turning," clearly illustrates all operations in the machining of a shaft held between the lathe centers. It teaches many of the basic procedures encountered in all lathe work. Among these are blueprint reading, measuring with calipers and micrometers, locating and drilling center holes, proper selection of cutting tools, rough turning and finish turning of the work piece.

CHARTS

Lathe Practice Charts. Atlas Press Company, Kalamazoo, Mich. Ten cent charge for handling and postage.

For the assistance of industrial arts instructors, Atlas Press Company, Kalamazoo, Mich-



igan, has issued a series of blueprint wall charts (see illustration) on lathe practice.

(Continued on page 24)

NEWS *from* INDUSTRY

● Supply Firm Changes Name

Long's Woodcraft Supply is the new name of the firm of Bauman & Long, of Goshen, Ind. The firm, specializing in home and school woodshop supplies, also announces the completion of a new, large building to take care of the growing demand for woodworking materials.

Products handled by the firm include kiln-dried lumber, stock panels, special panels and tops, solid lumber tops, hardware, knocked-down furniture projects, knee-hole desks, cedar chests, book cases, tables, glue, finishing materials, and mouldings.

Catalogs

● **Lathes**—South Bend Lathe Works. Condensed Catalog, No. 52, showing complete line of South Bend Lathes.

The eight pages of condensed data include illustrations, basic dimensions, capacities, speeds, and feeds of back-geared, screw-cutting lathes having 9, 10, 13, 14½, and 16-inch swings, with bed lengths from three to twelve feet. Attachments for toolroom and production work are also illustrated and described.

This catalog, measuring 8½ by 11 inches, may be placed in a binder or filed in the standard letter file. Copies of the catalog, No. 52, are available upon request from South Bend Lathe Works, Dept. S5, South Bend, Ind.

● **Shop Furniture**—E. H. Sheldon & Company. Shop Section of Catalog No. 25.

The Shop Section of Catalog No. 25 of E. H. Sheldon & Company, Muskegon, Mich., has just been issued, showing this company's complete line of shop benches, drafting tables, cabinets, tool and supply cases, vises, and other items of shop furniture and equipment.

Newest items in the Sheldon line are a 19-foot parachute-packing bench and two shop benches offering a number of different combinations of drawer and cupboard units, lengths of top, and with or without the use of legs.

SCHOOL SHOP readers wishing copies of the items listed in this column, which will be a regular feature of the magazine, may secure them directly from the firms listed or through SCHOOL SHOP. Inquiries to this office should be addressed to News From Industry Dept., School Shop, Box 100, Ann Arbor, Michigan.

BLUEPRINT READING

● **New 1941: "Blueprint Reading, Checking, Testing" by Steinike. Write for approval copy to Dept. S1, McKnight & McKnight, Bloomington, Ill.**

McGraw-Hill Books

FOR

Defense Training

★

BLUEPRINT READING

By John J. Weir, Dickinson High School, Jersey City, N. J. **$1.25**

MACHINE TOOL OPERATION

By Henry D. Burghardt. Part I: Lathe, Bench, Forge—**$2.25.** Part II: Drilling, Milling, Planing, Gears. **$2.75**

WOOD PATTERN-MAKING

By Herbert J. McCaslin, Dickinson High School, Jersey City, N. J. **$2.25**

MECHANICAL DRAWING

By French and Svensen. **$1.60**

UNDERSTANDING RADIO

By Watson, Welch and Eby, Stockton (Cal.) Junior College. **$2.80**

THE AVIATION MECHANIC

By Carl Norcross, Managing Editor, *Aviation,* and J. D. Quinn, Jr. **$3.00**

AIRPLANE MAINTENANCE

By Younger, Bonnalie and Ward, Boeing School of Aeronautics. **$3.00**

★

Penn State Industrial Series

MECHANICS

By John W. Breneman **$1.50**

STRENGTH OF MATERIALS

By John W. Breneman **$1.50**

MATHEMATICS

By John W. Breneman **$1.75**

BLUE PRINT READING AND SKETCHING

By H. R. Thayer. **$2.00**

Write for new descriptive booklet, "McGraw-Hill Books for Defense Job Training."—Have you seen the McGraw-Hill *Technical Education News?*

McGraw-Hill Book Co., Inc.
330 W. 42nd St. New York

Washington Letter

by **Alan Murray**

We inaugurate this column with a note of warning. Washington is overloaded with correspondents. There are the inside-dopesters, the axe-grinders, the nation-is-going-to-hellers, the famous-namers, the prophets, the pundits, and the plain proletariat who wire the home town that Gadsden County, Wyo., has been allotted $203,847 for something or other. Taken as a whole, their work consciously or unconsciously is a slightly out-of-focus picture of what really is happening in Washington. The soundest policy is to disbelieve half of what you read about Washington and doubt the other half. Nevertheless, we humbly offer the following items.

● There are those who believe the nation's structure of training for youth is growing increasingly topheavy. As they see it, the industrial arts program was superimposed originally on the existing academic secondary-school structure, much like adding a second story to a house. Then the vocational education program was superimposed on the industrial arts program. Now, with the war emergency, the special defense training program has been superimposed on the regular vocational education program. In this view, it is all beginning to look—and sound—like the Tower of Babel.

● Some of the biggest Washington headaches are resulting from the displacement of workers through the issuance of priorities. Nondefense plants using aluminum, copper, brass, zinc, rubber, and silk will be hardest hit. It is predicted that two million employees may lose their jobs by next March. Most of these workers lack necessary skills to transfer readily to defense industries. Rapid training for defense jobs is required as part of the solution. *It will be no surprise to find additional funds allotted for the defense training program, which is currently spending about $100,000,000, not including engineering training.*

What is called the Buffalo plan is gaining favor and is now being used in Philadelphia also. Broadly, it consists of a unified effort to find work for large units of displaced workers. During August, 3600 workers in one plant in Buffalo were thrown out of work, due to the closing of the plant and its shift from nondefense to defense production. Only 600 were able quickly to find other work. The balance are receiving special vocational training courses in the hope of their being absorbed by industry in the near future, with unemployment compensation helping them to survive in the meantime. Schools in industrial areas may have this new task thrust upon them.

● About eight million dollars had been allotted by September 1 for new school buildings in defense areas, of the $150,000,000 available for that and related purposes. Under the terms of the appropriation, allotments cannot be made for vocational or trade schools, *but they can be made for secondary schools with industrial arts and vocational education departments.*

● On paper, all conflicts between the National Youth Administration and the public schools have been settled, with the school systems in complete charge of all training of NYA youth. In practice, however, frequent complaints are heard from both sides. Analysis of complaints indicates that most of them relate to fears for the future rather than actual cases of violation of regulations.

Two basic but unrelated issues keep the kettle boiling regarding the NYA, and to some extent, the CCC. First is the issue of local vs. federal control of education, with the public schools looking on NYA as a definite encroachment on traditional local control. Second is the issue of work experience as an integral part of training programs for youth. Any extensive integration of work experience with secondary education involves drastic changes in public-school curriculums, which many school authorities oppose. NYA officials and many other Washington authorities back such changes and believe federal agencies like the NYA are leading the way.

● There is an increasing emphasis on the use of interior portions of the United States as production centers in the defense program, with consequent increase in vocational training programs in these areas. Chief regions for the making of bombers, for example, will be Texas, Oklahoma, Kansas, and Michigan. The Ford plant for bomber bodies alone will employ 40,000 workers at Ypsilanti, Michigan.

● *More money for the regular vocational education program is in the air.* Executive Secretary L. H. Dennis of the American Vocational Association wrote recently in *AVA Journal and News Bulletin*: "But these combined funds (Smith-Hughes and George-Deen) no longer meet adequately the rapidly increasing public demand for vocational training throughout the nation. Therefore, provision should be made soon through increased federal aid for expansion of all vocational education in order that our school systems may concentrate on a long-term program of education for work that will lead into the period following the present national emergency."

Those espousing vocational education in Washington are well-known for their alert attention to carrying out proposals of this nature. Just when or how additional funds will be asked is not known and perhaps not decided. Instead of a new bill in Congress, other means of obtaining funds through general appropriations may be used. *There is little doubt that Congress is more favorable to vocational education than ever before.*

Instructional Resources

(Continued from preceding page)

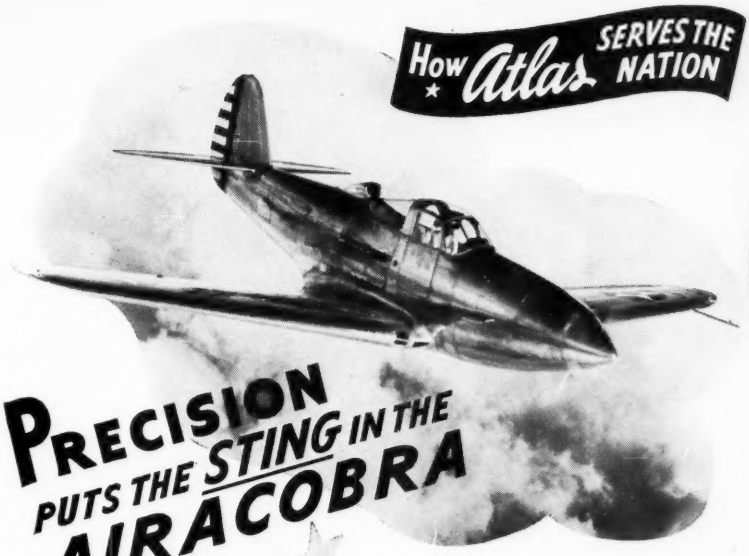
Three charts are now available: "Lathe Cutting Tools," "Thread Forms and Formulas," and "60° V-Type Thread Dimensions."

Each chart has been prepared at the suggestion of prominent industrial arts instructors and presents reference information useful to advanced students as well as beginners. The charts measure 16¼ x 21 inches and are printed on durable ledger paper. Ten cents in stamps is asked for the charts, to cover handling and postage expense. They will be sent free postpaid with each order for the Atlas "Manual of Lathe Operation," a 272-page instruction book covering every phase of lathe work. The price of this book to instructors is 75 cents. Address Technical Service, Atlas Press Company, Kalamazoo, Mich.

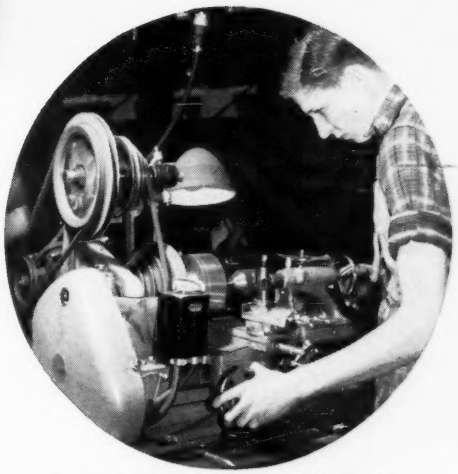
Index to Advertisers

American Technical Society.....21
Atlas Press Co......**Inside Rear Cover**
Bauman and Long.....21
Carpenter Steel Co......15
Casein Company of America.....19
Craftsman Supply House.....17
Frederick J. Drake & Co.....**Inside Rear Cover**
Education Digest.....**Inside Rear Cover**
Walter O. Guilohn, Inc......17
Higgins Ink Co., Inc......11
Horton Handicraft Co......17
Long's Woodcraft Supply.....21
McGraw-Hill Book Co., Inc......23
McKnight and McKnight.....17, 21, 23
Mead Specialties Co......17
E. H. Sheldon Co......15
South Bend Lathe Works..**Outside Rear Cover**
Thurston Supply Co......21
John Wiley & Sons, Inc...... 9

How ★ Atlas SERVES THE NATION



PRECISION PUTS THE STING IN THE AIRACOBRA



In the Bell Aircraft Plant at Buffalo—the Atlas 10-inch Lathe helps importantly in machining small parts.

A thousand horsepower in its compact engine—guns ready to blast enemy bombers, the 400 MPH Airacobra interceptor pursuit plane is a striking symbol of America's growing defense. Bell Aircraft has found that Atlas Lathes meet the exacting precision needs of many small but vital parts that must be turned out for this modern warplane.

Atlas Equipment is ideal for defense training. Your equipment dollars buy more Atlas tools—and give more students a chance to acquire mechanical skill with practical hand training—on the same machines used in industrial shops.

Specify Atlas when your equipment needs are further expanded by the demands of defense training.

Atlas
ATLAS PRESS CO.
KALAMAZOO, MICH. U. S. A.

LATHES • DRILL PRESSES • ARBOR PRESSES • SHAPERS • MILLING MACHINES

Why You Should Subscribe to

THE EDUCATION DIGEST

1. The EDUCATION DIGEST brings you condensations of the most worthwhile and interesting articles from the more than 600 educational periodicals.
2. It will keep you well informed on educational matters with a minimum expenditure of time and money.
3. You will not miss such important pronouncements as the Educational Policies Commission reports, the New York Regents' Inquiry, the President's Advisory Committee Report, etc.
4. States H. P. Collins, Principal, Junior High School No. 1, Trenton, N.J.: "The money I can spend and the time I can give to the reading of educational magazines is limited and the EDUCATION DIGEST provides me with a collection of leading articles of far greater scope than I could possibly get otherwise."

SUBSCRIPTION $3 A YEAR

Send your subscription order now to

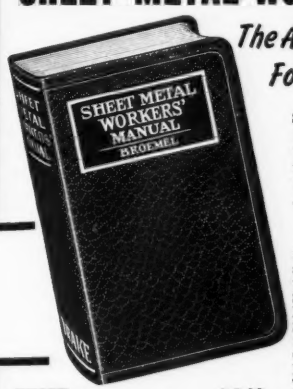
THE EDUCATION DIGEST

Box 100s

ANN ARBOR, MICHIGAN

SHEET METAL WORKERS' MANUAL

The Authoritative Text Book For School Shop use.



PRICE $2.00
Less regular school discounts

Many other authoritative text books are also available, including:

Electric and Oxy-Acetylene Welding	$1.50
Practical Electricity and House Wiring	$1.50
Diesel Engines and Diesel Electric Power	$2.50
Wooden Boat and Ship Building	$1.50
Plumbing, Installation and Repair	$1.50
Practical Instruction for Paper Hanging	$2.00
Aviation from the Ground Up	$3.00

Send for the Drake Catalog containing full information about these and many other Drake books.

Sheet Metal Workers' Manual, by L. Broemel is the outstanding work of its kind. Contains chapters on Elementary Sheet Metal Work for Schools by J. S. Daugherty of Carnegie Institute.

Complete—Concise

Subject matter is divided into 15 sections covering all phases of the work, including chapters on The Sheet Metal Industry; Tools; Sheet Metal Working Machinery; School Shop Equipment; Pattern Drafting; Oxy-Acetylene Welding and Cutting; Electric Welding; Hand Forging and Welding; Metals and Their Alloys; Geometry and Mensuration; as well as many useful tables.

An Approved Text Book

This book is now used as text book in many leading Industrial and Trade Schools, U. S. Navy and Army Schools, High Schools, and National Defense Training Department of Schools.

Sheet Metal Workers' Manual is Cloth Bound, pocket size, containing 552 pages and 375 illustrations. Price $2.00. Regular school discounts apply on all orders. Let us send you a copy on approval. Examine it carefully—see if it fits your needs. If not, you may return it without further obligation.

Order Today

FREDERICK J. DRAKE & COMPANY

600 West Van Buren Street, Chicago

Drake's Books are sold at all good book stores.